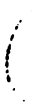
ON CORPULENCE

IN

RELATION TO DISEASE.



ON CORPULENCE

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RELATION TO DISEASE:

WITH SOME REMARKS ON DIET.

BY

WILLIAM HARVEY,

FELLOW OF THE ROYAL COLLEGE OF SURGEONS, AURAL-SURGEON TO THE GREAT NORTHERN HOSPITAL, AND SURGEON TO THE ROYAL DISPENSARY FOR DISEASES OF THE EAR.

LONDON:
HENRY RENSHAW, 356, STRAND.
1872.

LONDON:
SAVILL, EDWARDS AND CO., PRINTERS, CHANDOS STREET,
COVENT GARDEN.

PREFACE.

SEVERAL years have passed away since Mr. Banting consulted me for Deafness, the treatment of which led to his publishing a pamphlet on Corpulence. It was not my intention to appear in print on this subject, but for an inconvenient correspondence, and which I find is but of little avail to reply to by letter. I therefore think it expedient to give a brief outline of the views which led to the treatment of his infirmity, which may interest the reader, and possibly prevent much misunderstanding.

Few who have passed many years in the practice of medicine but must have been aware how little attention had been directed to this painful condition of the human body, more especially with reference to its dietary treatment. Indeed, the medical history of former years is so unsatisfactory on this point, that it was considered a most singular disease, with but little hope of relief, the main reliance for its cure or mitigation being placed on the exhibition of drugs, and certainly those of the most nauseous description. The marvel is that any one was found

with sufficient resolution to persevere in a treatment of this character, and even when rigidly followed, rarely resulting in cure. The advance made in physiology and animal chemistry of late years has thrown light on the treatment of this disease, and has happily now enabled us to explain those hitherto chance recoveries on rational and definite principles. My own special attention was drawn to this subject in consequence of its frequent occurrence in connexion with defective hearing in one or both ears—most probably arising from stealthy and insidious depositions in the canals leading to the air-passages of the nose and throat—and had Mr. Banting not suffered from deafness, the probability is that his pamphlet would not have appeared.

In this essay I shall endeavour to show how much the treatment has been misapplied in many cases, particularly by those who have rashly and indiscreetly adopted a system which required the greatest caution by their medical adviser. It was also natural to expect that a pamphlet on a dietary for the cure of Corpulence, coming from a lay source, would not have found much favour with the profession, and that it would receive some severe criticism. By some it has been highly lauded; by others, blamed: on the whole, it may be said that it now holds a place in every issue or monograph from the medical press relating to diet and nutrition.

The history of medicine contains numerous instances of extraordinary cases of Corpulence, and an immortality attaches to some persons, solely on account of their special aptitude for the development of fat. It is not in reference to such exceptional examples as some of the earlier records of medicine unfold that the practitioner is likely to be consulted, but the cases are not infrequent in which his aid may be solicited in mitigating the inconveniences which excessive adipose development entails.

The sufferers from this disease are found most frequently among those on whom fortune has smiled, whose incentives to physical exertion are in abeyance, while the inducements of the table are in excess. Nevertheless, among the out-patients of hospitals we occasionally notice cases in which Corpulence has been the cause of a variety of subjective symptoms which have made life wretched.

There may be others, and probably many, in private life, who doubtless have had good sense and courage enough to adopt a line of conduct which resulted in cure; but the instances on record are, I believe, sufficiently rare to authorize a publication altogether devoted to the subject. But as the history of persons who have actually died from great accumulation of fat, for the most part only excites a temporary surprise, it may at least be worth the attempt, to see what may be effected by an accurate account of others, who

have successfully struggled against a laborious existence and premature death.

The extraordinary case of the late Mr. Lambert, and of John Bright, of Malden, whose weight was, the first fifty-four stone, the other forty-three, are forcible examples in point. From the detail of their lives it does not appear that any decided attempt was ever made to arrest the progress of the disease, which, from an early period, seemed rapidly to increase, and the termination of which must have been foreseen. But whether this inattention arose from *ignorance*, or from the common *prejudice* that the complaint is so connected and interwoven with the constitution as to be irremediable, is matter of conjecture; and we are only left to wonder that these prodigies of clogged machinery should have continued to move, live, and have their being for so many years. And these points I hope to show ought of necessity to be observed in the treatment of this distressing disorder of the human economy.

It is only by returning to the views and opinions of medical authorities a century ago that we can duly appreciate the vast service Chemistry has rendered physiology, and, indirectly, practical medicine. The influence of *respiration* in removing carbonaceous materials from the blood, and the possibility of the production of fat *from farinaceous and saccharine bodies*, are so familiar to us now that we wonder at the absence of knowledge on these subjects displayed

by the older writers; they all insisted on a non-nutritious diet for the cure of Corpulence, meaning thereby an avoidance of meat, and an indulgence in milk and a farinaceous diet. A great mistake was also made in supposing that the urine was the only outlet for fatty matters, while they ignored that by the lungs.

Until corpulence is far advanced, persons rarely become objects of attention; many have even congratulated themselves on their comely appearance, not seeking advice or a remedy for that which they did not consider an evil; but it must not be supposed that it is a matter of little moment, nor ought we to be satisfied in postponing its remedial treatment.

Although the views herein offered may, even if practically and judiciously carried out, fail to prolong the natural term of existence, still they afford us the satisfaction of knowing that we may ward off those accidents which would otherwise lead to its premature termination. We cannot of course augment the allotted measure of our vital energy, but we can, at least, learn to husband its resources, and not to consume with wanton indifference the unrecruitable oil by which the lamp of life is supported.

In Sir John Forbes' work, "Nature and Art in the Cure of Disease," are the following observations, which I take leave to quote in this place:—"All well-informed and experienced members of the medical profession are painfully aware of the great imperfection of their art, and of its inadequacy to fulfil in a satisfactory

manner much that it professes and undertakes to accomplish. It must be admitted, however, at the same time, that this recognition of its defects is accompanied by an ardent desire and by incessant efforts on the part of its professors to lessen and remove them. It may indeed be truly said of the professors of the medical art generally, that a lively zeal for the promotion of every kind of knowledge on which it rests is one of the features of their character. Few are contented to practise medicine as an art, and still fewer to practise it as an art that has reached the point at which it can be regarded as satisfactory, much less as perfect. By this universal striving for improvement, the practice of medicine is perpetually changing; advance and not retrogression must be admitted as the general result. Such results, as in the case of those already attained, can be only expected to flow from the co-operation of innumerable labourers scattered probably over long tracts of time, who must be content to add to the general stock I have referred to above. Without much prominence of individual handiwork, certainly, in the disease under consideration [Corpulence], we have evidence of its progressive improvement, and a certainty as to its successful treatment, during the last twenty-five years, since the advance made in physiology and animal chemistry. It is also true that since the period referred to great advances have been made in some important points of the history of diseases, as in the structural

pathology, as well as in many of their physiological relations, so that it must be admitted that well-informed practitioners of the present day have a much deeper insight into the exact character of many of the diseases treated by them than was possessed by their predecessors."

2, Soho Square,
April, 1872.

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"Corpulence est un état anormal de corps qui a été dans tous les temps seulement constaté et décrit, principalement comme étant un phénomène curieux; alors, comme aujourd'hui, personne n'avait étudié cette constitution avec les inconvénients, les accidents, les infirmités et les maladies qu'elle produit ou qu'elle entretient. Les remèdes que l'on trouve indiqués dans les livres pour faire cesser cet état du corps ne sont fondés, comme nous le démontrerons, sur aucun principe. Aussi les auteurs mêmes ne les donnent pas comme infaillibles; bien plus, corpulence est considérée comme incurable par des moyens rationels."—*Dancel.*

"CORPULENCE is not only a disease itself, but the harbinger of others." So wrote Hippocrates, two thousand years back. Authors of antiquity, and also of modern times, writing on this subject, have made mention of Corpulence as affecting in its insidious progress the internal organs of the body—the heart, lungs, and abdominal viscera—but none have made any pointed allusion to its distressing effects on the senses of *Hearing, Sight, Taste,* and *Smell.* My atten-

tion has long been drawn to it as a frequent cause of a growing deafness towards the meridian of life. Some years ago I suggested that two other diseases might be aggravated by this condition—viz., Rheumatism and Gout. There are other cases of deafness complicated with an excessive development of fat, which will not yield to ordinary treatment unless a scale of diet be adopted in which saccharine and starchy materials are in some degree avoided, whether these be found in food or liquid. As a rule, in these cases, the patient should take a larger amount of animal food, but not to the exclusion of those fruits and vegetables which contain but little of sugar or starch. This treatment has great influence on such cases, and a further experience has confirmed a dietary regulation in the case of deafness, which will be detailed further on in this essay. I may here say that I have observed the symptoms to be very similar in both sexes; but, in the female, I believe, they are more persistent, probably from her sedentary habits of life.

These cases are sufficiently numerous, replete with interest, and of great practical importance to the Aural practitioner. Some, indeed, are established with a sufficient degree of certainty to admit of a decided relief from this mode of treatment, while there are others that may reasonably admit of some doubt.

In order to assist the diagnosis of this type of chronic deafness, it will be my object first to give in

detail the general symptoms which characterize the complaint from its first development in the system; and, in the second place, to enumerate those particular points which are apt to engross the attention of the patient and his friends in the course of its progress.

As I shall have occasion to refer to the cause of this disordered condition as a glandular disturbance of the mucous membrane of the nose, mouth, and throat, particularly of the naso-palatine portion, and its various sympathies, it will be more convenient first to give a brief outline of its distribution through the various canals of those organs in which these membranes are localized. It will be observed that in the treatment of this troublesome disorder it must be looked upon as a local expression of a constitutional cause, and therefore requiring in a great measure a constitutional treatment for its cure or relief.

"Chronic diseases," says Sydenham, "proceed from ourselves;" and although corpulency may be ranked amongst the diseases arising from original imperfection in the functions of some of the organs, yet it must be admitted also to be most intimately connected with our habits of life. For which reason the inconveniences arising from it are to be removed chiefly by dietetic remedies. It will be unnecessary here to make any remarks on this head, as a general account will be given in the after-part of the essay.

An attentive, and especially an instructed observer,

looking into the throat, will readily make out—1, the uvula; 2, the pendulous palate; 3, the isthmus of the fauces, and the tonsils on either side; 4, still further back, the interior of the pharynx. All these structures are invested by a mucous membrane. Towards the base of the tongue may be seen two membranous folds (the pillars or columns of the fauces), descending from the soft palate. These inclose a triangular space on either side, in which the tonsil is imbedded. There are, moreover, musculo-membranous folds. In the anterior fold is placed the constrictor muscle of the fauces, in the posterior will be found the palato-pharyngeus. The base of the tongue is below. The glandular bodies called the tonsils, are surrounded, as it were, on all sides by muscular organs acting on and compressing them, and causing intense agony when they happen to be acutely inflamed and swollen. In chronic enlargements no such suffering happens, and the increase of size is scarcely known to the patient from any physical annoyance.

Immediately behind the isthmus may be seen the interior of the pharynx, but more especially that portion of it which, extending upwards to the base of the cranium, and backwards and downwards along the front of the spinal column, communicates more immediately with the posterior nostrils and the Eustachian tubes. This is the cavity which the illustrious Dzondi, one of the most practical surgeons of his day, viewed as distinct from the lower portion of the

pharynx, being momentarily separated from it during the act of deglutition by the action chiefly of the palate-muscles, and of the palato-pharyngeal muscles. This temporary, and, as it were, momentary division of the bag of the pharynx into two cavities, distinct for the time being, becomes occasionally a permanent arrangement, as the result of adhesions of the palate and uvula to the posterior wall of the pharynx.

Before we can enter with advantage into the present inquiry, so as fully to understand the development of the particular morbid action soon to be considered, the author deems it right to give a brief description of that part of the mucous membrane with which we are now engaged, as also of its leading sympathies, as well as of the muscular arrangement of the pharynx, since many cases of disease may be explained and readily accounted for, by bearing in mind the nature of the several structures liable to be affected.

This membrane lines all the cavities of the body which communicate with the external integuments. Bichat divided it into two great portions—*scil.*, the gastro-pulmonary, and the genito-urinary. The former —that division which alone is now to be considered— commences at the eyelids, nose, and lips; the part going to the eyes communicating with the nose by the lachrymal canal through which the tears flow. This same membrane also enters the cavity of the nostrils, forming the pituitary membrane, and entering

the apertures of the Eustachian tubes, lines the internal surface of the membrana-tympani, as also the cavity of the tympanum. It then extends over the nostrils, lining the septum narium, and having entered the several sinuses in that direction, is again lost in the external skin about the nostrils. But before this takes place, it is continued into the nasal duct with its sac and the lachrymal ducts; and through the puncta lachrymalia is once more united with the common integuments. Here the tunica conjunctiva may be supposed to commence, which not only covers the anterior surface of the eyeball, but is continued through the excretory ducts, even to the substance of the lachrymal glands. Again, commencing at the external integuments of the lips, with which it may for a moment be supposed to be lost, this same membrane enters the mouth, affords a covering to the internal surface of the cheeks, and to the salivary glands, whose ducts traverse it, as also to the tongue; it then continues its course posteriorly. Behind the soft palate the mucous membrane from the mouth and nostrils becomes continuous, and from the throat downwards it divides into two portions—the one to line the air-tubes, the other the entire alimentary canal.

Observing the continuations of this membrane, and considering the manner in which the nerves, blood-vessels, lymphatics, &c., are distributed to it, the existence of a principle of sympathy, by which the

affections of one organ are transmitted to another, must be admitted; the advantage to be derived from this source in the employment of remedies will be readily recognised. On this point Müller says:—"A remarkable sympathy is observed to exist between the mucous membranes; thus their diseases, particularly the mucous discharges and the catarrhal affections, have a great tendency to spread in them. By virtue of this sympathy, the state of one part of these membranes may be ascertained by examining another, so that the state of the mucous membrane of the tongue indicates the condition of that of the stomach and intestinal canal. All the mucous membranes have likewise an extraordinary connexion with the respiratory movements; thus, irritation of the mucous membrane of the nose produces sneezing; irritation in the pharynx, œsophagus, stomach, or intestines, excites the respiratory movements; and gives rise to a concurrent action of the respiratory muscles, so as to affect their involuntary action, producing irritation of the mucous membrane of the larynx, trachea, or lungs, or even itching from irritation of the Eustachian tube, exciting coughing."

The mucous membrane, like the skin, is composed of three layers; the first, the epithelium, the cuticle of the membrane; the second is the *proper mucous*, or papillary layer, analogous likewise to the papillary layer of the skin. This is the surface which secretes and produces the epithelium. The third, the fibrous

or submucous, similar to the corium of the skin, is intended to afford support to the papillary layer.

In the loose cellular tissue connecting the two latter layers, are placed the glands or follicles, which are peculiar to the mucous membrane. These glands are of two kinds, simple and compound. Henle thus describes the simple follicles:—"In almost every mucous membrane, even in those which are destitute of glands, there exist other organs, apparently connected with the secreting action of the membrane. They are round or oval closed cells, visible even with the naked eye, and sometimes quite transparent, but at other times filled with mucous globules." The compound follicles, or glands, on the other hand, are thus described:—"The substances of these glands consist of a mass of round or oval completely-closed cells, of different sizes, and containing some granular matter, and other perfectly-formed mucous globules. A number of these cells united by cellular tissue, and perhaps also by a structureless membrane, form an acinus, and as such, are seated upon a branch of the excretory duct, into which the mucous globules, and other matter contained in the cells, are from time to time poured, in consequence either of the membrane of the cells bursting, or of its becoming dissolved at the part where it is connected with the duct."

These follicles are much more abundant in some parts of the mucous membrane of the air-passages and œsophagus than in others; thus the *tonsils* consist

almost entirely of mucous follicles united together by cellular tissue.

From the anatomy of the parts as above described, we pass on to notice the *morbid alterations in the condition of the mucous membrane lining the mouth and throat* to which they are subject. The mucous membrane which lines the throat is of a slightly red, or pale rose colour, in its normal or healthy state; but when it becomes the seat of inflammation its colour is altered, as it then passes from the naturally healthy hue to a deep scarlet, and eventually to a purple or violet colour, according to the nature, character, and intensity of the inflammation. It may be observed here that inflammation may attack any part of the structure of the mucous membrane separately; either the mucous membrane itself, or the mucous follicles, or finally the subjacent tissues. Inflammation of the mucous membrane itself is, generally speaking, spreading and diffuse; whilst inflammation of the mucous follicles, on the contrary, is circumscribed in its action. It sometimes happens, in the case of inflammation of the mucous surface, that the follicles may also take on the inflammatory process, and in this case, after the superficial inflammation has abated, it still may remain in the chronic form in the follicles.

After it has continued for some time in a mucous membrane, the lesion most frequently to be observed is a morbid thickening of the part affected; its surface

also often presents a granular appearance. To this lesion it will be necessary to direct attention, when that form of deafness is treated of, for the cure of which excision of the tonsil has been recommended.

Having thus endeavoured to give such description of the distribution of the mucous membrane of the mouth and throat as may suffice to make it clear how far the function of hearing may be interfered with by disease of this membrane; having traced it in its various divisions and continuations through the nares, the sinuses, and the Eustachian tubes; having tried to make clear the various sympathies, contiguous and remote, with different other parts of the body; having also exhibited in sufficient detail the chief lesions produced in the mucous membrane by inflammation, both acute and chronic,—the author will next endeavour to point out the lesions of this structure most likely to affect the organ of hearing, and the manner in which that effect is produced.

In the preceding pages it has been shown that, like other membranes of the body, the mucous membrane of the mouth and throat is liable to various degrees and kinds of inflammation, both acute and chronic, common and specific; on closer investigation, it will be found that inflammation of this membrane is further modified, partly by its various and extensive sympathies with other organs, and partly by constitutional causes. Scrofula, rheumatism, and several skin diseases, the exanthemata, as scarlatina, measles, and

small-pox, as also influenza and diphtheria, affect it more or less, and are observed occasionally to give rise to severe and permanent disease, with the function of hearing much impaired, and not infrequently with total destruction of the auditive organ. Every practical surgeon is well aware of the effects produced by the morbid poisons of this membrane, when they have deeply tainted the constitution.

It is quite unnecessary here to urge the very great importance which this membrane sustains with reference to the function of hearing, as there will be occasion to show that a large proportion of the cases of deafness met with in practice actually depend entirely upon inflammation of the mucous membrane of the throat extending through the Eustachian tubes to the cavity of the tympanum, which proves incurable, until due attention has been given to the extension of the disease throughout the whole cavity of the fauces. This membrane also covering the tonsil, and entering so much into its composition, is commonly associated in its inflamed condition with the enlarged gland, as well as with deafness, so much so, that the deafness has been somewhat hastily attributed to the closure of the mouth of the Eustachian tube by the enlarged tonsil; but how much more simple and obvious is the explanation founded on the extension of the inflammation through the whole lining of the mucous membrane of the tube to the tympanic cavity. This does not imply that there may not be exceptions to this

rule, but they are very rare as regards the need of operative procedure.

When the anatomical relations of the tonsils to the Eustachian tube are considered, it becomes difficult to conceive any way in which the enlargement of the former can so press entirely upon the expanded extremity of the Eustachian tube as to cause deafness. In the first place, the form of this trumpet-like opening carefully preserved by its cartilaginous and fibrous structures, and in the second place, its size, it being nearly half an inch in its longest diameter, militate against the probability of its becoming closed under ordinary circumstances. But when the relative position of the orifice with the tonsil is taken into account, the latter hanging an inch below the former, and when enlarged extending downwards and forwards, rather than upwards, it is difficult to conceive that the gland can by its enlargement block up an opening which is above it and altogether out of its way—exceptions of course occasionally occurring. The accompanying figure shows the relative positions of these parts.

As the functions of the mucous system cannot be too strongly enforced, a brief outline is here added. By its external anatomical position, this system is subservient to four great functions: the reception of impressions from without, the defence of the body from external injurious influences, the absorption of foreign particles, and the separation of such as are for any reason to be eliminated. It may also be said to

be the peculiar seat of these functions, which, however, are distributed in a very unequal manner over its different regions.

Reception of External Impressions.—The skin and mucous membranes appear everywhere fitted by their nervous supply to receive impressions, which, being conveyed to the nervous centre, may there excite a reflection of stimulus along motor nerves, without

FIG. 1.

ANATOMY OF THE THROAT.—Showing, *f*, the posterior nares; the cells of the sphenoid; *d*, the soft palate; *e*, the uvula; *b*, the position of the tonsils; *c*, the anterior palatine arch; *a*, the tongue; *h*, the under lip, and part of the windpipe.

the intervention of consciousness. Common sensation, or that which in its most exalted form becomes touch, exists in all parts of the cutaneous surface, within the mouth, for some distance within the nostrils, and (with the exception of the pharynx and

œsophagus) in general, wherever the epithelium is of the true scaly variety. Where the sense of touch is most perfect, the simple membrane is observed to be involuted into the form of papillæ for the purpose of crowding a larger number of nervous loops into a given space. *Taste and smell,* which are nearly allied to touch, are the other special senses of which the mucous system is the seat. The sensations of *hunger and thirst* seem also referrible to this tissue. The loss of taste and smell is early noticed in this type of deafness.

Breathing with difficulty through the nose is early complained of as causing much discomfort and inconvenience. Many will be found subject to this annoyance; and a much greater amount of disorder is produced by such a condition than has hitherto been considered. The affection to which I refer depends on chronic thickening of the mucous surface, which, throughout the windings of the nasal cavities and passages, goes by the name of the olfactory membrane. This thickening often exists to such an extent as to block up the passage of the nose entirely, and thus obstruct the principal channel through which respiration is, or ought to be, performed, as well as impede the performance of various other functions which will presently be adverted to. Owing to the great difference in the calibre of the nasal passage in different persons, it happens that in some the slightest tumefaction will cause obstruction, while in others the passage is so large that the disease may exist without much annoyance. It may at first appear

improbable that this kind of diffused enlargement of the mucous membrane, throughout all the cavities of the nose, will obstruct the passage entirely.

Many cases are common in which there is a thickening of the nasal membrane to such an extent, that although it does not produce entire stoppage, yet the impediment is increased so as to render it complete, whenever the membrane is additionally swollen by this chronic deposition. Here the difficulty in the breathing, especially in attempts to sleep, becomes quite as distressing.

The voice also becomes much affected, the back part of the nasal meatus being converted into a shut chamber, by which the sounds produced in the mouth and throat acquire a nasal resonance and timbre, which make the voice more distorted and muffled.

There is generally experienced in these cases a difficulty in hawking mucus from the back of the throat and the posterior nares, from the inability of drawing air up freely behind the *velum palati*. I have seen cases in which a difficulty is observed in expectoration. From the same cause there is frequently a difficulty and even an impossibility of blowing the nose, which is excessively inconvenient and disagreeable, even causing pain.

The effects of this kind of obstruction to the sense of smell are very perceptible. Without the power of inspiring through the nose, we lose in great measure the capability of drawing odorous particles within the sphere of the olfactory nerve. In addition to the

difficulty thus occasioned, it is certain that a tolerably healthy state of the mucous membrane is necessary for the proper exercise of this sense. Common catarrh may be taken as an instance, in which the obstruction caused by this kind of irregular swelling of the mucous surface, and the alteration in the secretion from the nasal or Schneiderian membrane, either blunts or temporarily destroys the olfactory sense. Those persons in whom the nose is permanently obstructed by thickening of the mucous membrane are in much the same situation, as in addition to the simple obstruction, the secretion of mucus is generally disordered either by excess or deficiency.

Besides the unpleasant effects on the expression of the face, the respiration, the voice, and the sense of smell, there is one other circumstance to which I would direct particular attention from its being a novel view of a subject to which less importance has hitherto been attached than it deserves—namely, the connexion of nasal obstructions with defective hearing.

I have seen and treated many cases, in which deafness appeared to depend solely on nasal obstruction from adipose deposit.

That the presence of air is necessary in the tympanum, and also that the air should not differ greatly in temperature from the air on the external surface of the membrane of the tympanum, is obvious. The means by which these requirements are provided for, are well known to be the Eustachian tubes; but I believe, in

addition to this, a free state of the nasal passage is a necessary auxiliary, and that without it the function of the Eustachian canal cannot be properly performed. This view is supported by the anatomical position of the mouth of the tube, which points towards the external nasal aperture, and is directly in the line of the passage of air through the nose both in inspiration and expiration. Further, there is the trumpet-shaped extremity of the tube, and its direction, obliquely backwards to reach the middle ear, which favours, and appears to provide for, the entrance of air to the tympanum in inspiration rather than in expiration. It is not that simple stoppage of the nasal passages can cause deafness, because the nose may be closed without producing the slightest immediate effect on the hearing; but I consider that when the nose is, from the cause alluded to, obstructed, the want of a free circulation of air in the tympanum lessens the sensibility and acuteness of the auditory organ, and favours accumulation of mucus in the middle ear. Air enters the Eustachian tube and middle ear to a still greater extent in sneezing, an act in which the communication between the air tubes and the mouth is sometimes shut off by closure of the posterior palatine arches, so that the breath passes upwards, and escapes by the nostrils alone. There is in sneezing also a violent preliminary inspiration, which generally drives air up the Eustachian tubes with considerable force. Hence it occurs that yawning and sneezing are occasionally the means of relieving

or curing deafness, dependent on obstruction of the passages leading from the posterior nares to the ear, the sudden rush of air breaking up and expelling any inspissated mucus that may have accumulated therein.

I venture to say that the cases of this kind mentioned in this essay constitute one of the improvements of aural medicine; and, with a recent author,* I think it may be stated in the affirmative that modern medicine *has kept pace* with the times, being not only directly applicable in cases of this description, but in many others indicating a most important principle in recoveries hitherto too much neglected by the medical profession—viz., rational treatment of diseases which, when further studied, will be better understood.

The loss of the olfactory function is a very early symptom complained of in this type of diseased action; but it is not until its insidious progress towards the ear, producing dulness of hearing, or partial deafness, that notice is taken of it by the patient: the difficulty of breathing freely through the nose producing meanwhile great discomfort and inconvenience. Some will have suffered from this chronic enlargement of the mucous membrane for years, often existing to such an extent as to entirely close the nasal cavity, particularly when aggravated by cold or catarrh; the voice is frequently muffled and nasal in tone from the progressive deposition towards the soft palate: then follows a

* Corsby, "Hunterian Oration."

difficulty in expectoration or clearing the throat of the mucus, or even an impossibility of blowing the nose without pain or neuralgic inconvenience.

The symptoms by which we may early recognise this type of deafness are the following. They are presented to the aural practitioner generally for the relief of a disagreeable—to use a very significant expression—"stuffiness" in the outer ear, supposed to be a collection of wax. We generally learn that a prolonged syringing has been practised for its cure. This proceeding can have no avail in a defect of this nature, which is certain of further displacing the already thickened membrane of the drum, and aggravating the evil it was intended to relieve. Although simple in its character, this operation is sometimes in these cases attended with pain and inconvenience, often disappointing both surgeon and patient. A cursory examination by the speculum will decide that the canal is not only free from any obstruction, but generally dry, and the membrane of the drum concave. It is well to bear this in mind before any such interference is adopted in these cases.

Quite recently I had under my care two very well-marked cases: one that of an elderly clergyman, and the other that of a female, both exceedingly corpulent. The usual symptoms were very significant and progressive: first, an uneasy sensation of the nasal passages and root of the nose, huskiness of voice, and a gradual inconvenience in the act of swallowing

from the naso-palatine membrane enlarging and swelling, and the consequent increase in the size of the tonsils and uvula. All these effects might be anticipated, when we consider the glandular arrangement of the parts, and how much these glands sympathize in the general disorder of the system. As regards the progress of the disease towards the internal portions of the ear, we know by the continuous surface it must partially, and in some cases totally, obstruct the Eustachian passages, progressing gradually to the tympanum, producing a defect in the hearing, or partial deafness, and a disagreeable buzzing sound, on one or both sides of the head.

Local treatment in each of these cases had been vigorously adopted, not only by the removal of the tonsils, but by other manipulations, which, as might have been expected, had failed in relieving the symptoms; while, on the contrary, the cure was apparently evident in the adoption of the regiminal dietary—which will be referred to more at length, more especially in reference to the nature and cause of corpulence.

It may be also observed that in those cases in which the secretion in the nasal passage is profuse, the deafness is not pronounced, and a temporary relief is obtained by the use of the handkerchief.

It is satisfactory to observe how in each case the senses sympathized in the treatment: first, the return of the olfactory functions, and then the extension of the hearing distance, after the absorption of the

adipose tissue permeating the canals in which these organs of sense are seated.

I will just summarize the foregoing observations by adding that these glands are not unfrequently the seats of other morbid changes, which cause great trouble to the patient. The first of these changes is the production of an excessive quantity of viscid mucus; the second, the formation and discharge of a pus-like fluid; and the third is the retention of either of the secretions in the cavities of the glands, and its conversion into fœtid, cheesy masses, which are from time to time extruded through the nose or mouth.

The presence of this naso-palatine gland disease may be inferred from the following symptoms:—Discomfort, aching, or pain in the neighbourhood of the soft palate and posterior nares; tingling or sense of fulness about the root of the nose; frontal headache; a mawkish or fœtid taste in the back of the mouth; a thick mucous, purulent, or cheesy secretion, discharged at intervals, chiefly through the mouth, by means of snorting nasal inspirations, followed by hawking, perversions of taste and smell, alterations of voice, and temporary deafness, from obstruction of one or both Eustachian tubes. The presence of this disease can be demonstrated by rhinoscopic examination.

"The simple hypertrophy of the adenoid layer of the pharynx, without the formation of vegetations, may exist, as, for example, in the recessus or sinuses

which are then filled up by the same brittle structure, and seem to be altogether absent.

"When these adenoid vegetations are present, the surrounding mucous membrane is often in a morbid condition.

"Thus, the mucous lining of the posterior wall of the oral part of the pharynx is often swollen, or is covered with enlarged follicles, or with vertical folds, or exhibits the granular condition known as pharyngitis granulosa. The granulations found in this latter disease vary in size, and the largest sometimes resemble in shape and consistence those soft cushion-like excrescences which I mentioned as occurring in the lower part of the posterior wall of the naso-pharyngeal cavity.

"The pharyngeal granulations have recently been examined by R. Wagner, and have been found to be also composed of adenoid tissue. Consequently the cushion-like vegetations may be considered as transitory forms between the larger excrescences and the granulations of the visible part of the pharynx.

"In these cases the tonsils are often in a state of chronic enlargement, and more or less hardened.

"The soft palate and its arches are frequently thickened, approximated to the posterior wall of the fauces, and deficient in mobility.

"Lastly, the mucous lining of the nasal cavity is found in many cases swollen and reddish, although in extreme cases its secretion is decidedly deficient.

"These morbid conditions of the mucous membrane, however, are necessary concomitants or sequelæ of adenoid vegetations, and *vice versâ*. Still, it is rare to find the fauces and nares in a normal state when great numbers of vegetations exist, showing that the latter are, at least in some measure, due to the same influences which give rise to a chronic inflammatory state of the whole superior portion of the respiratory passages.

"*Symptoms.*—It is obvious that the symptoms caused by the presence of adenoid vegetations must vary according to the number and size of these as well as to the locality in which they are situated.

"If they are few in number and small, the symptoms may be wanting entirely; if, on the other hand, the growths are so exuberant as to completely close up the air-passage through the nose, the symptoms are marked. The patient will be compelled to keep the mouth open, the nose thereby gradually collapsing and growing thin; the pronunciation will assume the "dead" character, for the voice loses its resonance in the naso-pharyngeal cavity, and it is perfectly impossible to pronounce clearly the nasal sounds. Finally, the expansion of the growths may cause the sensation of a foreign body behind the posterior nares."—Dr. MEYER.

All the observations that I have hitherto made warrant me in saying that "throat deafness" is more frequently due to ear disease than to enlargement of

the tonsil. The two are not uncommonly associated; but I have no satisfactory evidence that they are necessarily related.

Naso-palatine gland disease is locally difficult to cure. I have tried many plans of treatment with varying success. The one which has answered the best is as follows:—The naso-pharyngeal membrane is irrigated with a solution of chlorate of potash several times daily for a week; then a very strong solution of nitrate of silver is applied to the naso-palatine surface by means of a brush, fastened to a properly bent handle, and the application repeated two or three times at intervals of two or three days; and lastly, the nose and throat are again irrigated by a weak solution of tannic acid or alum. In beginning their use, it is a point of practical importance that they should be very weak; when necessary increasing their strength, which should be done slowly and by degrees.

Irrigation is done by putting the nostrils under the surface of the irrigating fluid, and drawing it through the posterior nares into the mouth. In this way the remedial agent is brought into direct contact with the diseased surface. The operation, difficult to perform at first, and, when performed, painful, soon ceases to be in any way a trouble to the patient. I regret to have to add, that in ordinary cases I have found benefit only from constitutional treatment with regulated diet. It is otherwise with the enlarged

tonsil, which sometimes resumes its normal condition under the influence of iodide or bromide of potassium, iron and alkalies; local applications alone are unsuccessful. But I may here repeat, that steaming or fumigating has, in my experience, the most beneficial influence on this troublesome affection.

Much discussion of late has taken place on the function of the olfactory nerve, and I venture to digress a little in order to offer a few observations with reference to it, since it is so frequently presented to the aural surgeon in connexion with deafness. Hearing, taste, and smell act so constantly together, that we not unfrequently confound them.

As this nerve has not been investigated, with any particular reference to disease, since the memorable paper of Sir C. Bell, I consider it may be of interest to state some of the more recent points of the argument. Cases are not unfrequently presented to the aural surgeon of deafness arising from injury to the head, and as a consequence, loss of smell and taste—the olfactory function generally being lost on one side prior to that of taste. I have a case under my treatment at present of a young man who, while in a state of intoxication, fell on the back part of his head. He states that on his recovery in the morning, to his surprise and sorrow, he found his smell lost, a defect in his hearing; and subsequently, loss of taste. The aroma of wines, or any pungent articles—ammonia, onions, snuff—are quite lost to him, and

have no effect on the olfactory nerve. He can recognise the taste of salt, bitters, acids, &c.; but this only as these articles descend over the back part of the tongue. There is no paralytic symptom otherwise, nor loss of appetite. The tactile sensibility of the nostril is normal in progression. Afterwards a partial deafness followed on both sides: however, this is not often the case, one generally being the most affected, although, *mutatis mutandis*, the same pathological phenomena are observed; the concussion and congestion in the one case following the blow, though we had the insidious deposit of adipose material filling up the olfactory canals in the one I am now considering.

The other was that of a man, over sixty, who for years together had disease in his ear, which was followed by facial paralysis, which remains permanent on the paralysed side.

The other cases are from facial palsy, the result of long-continued ear disease, and in each case the loss of smell was total on one side of the nostril; on the other partial. In a deeply-interesting paper by Dr. W. Ogle, recorded in the "Medico-Chirurgical Transactions" for 1870, the author records five cases of *anosmia*, or loss of smell, arising from injury or disease of the head. But I see no reason why, in the same order, although not in degree, it may not arise from disease in the mucous membrane—the result of an excess of fatty deposit, and permeating the cells of the

olfactory apparatus. The anatomical arrangement will, I think, support it, as we know that the anterior brain rests directly upon the bones of the skull, and is not separated from them, as is the case elsewhere, by the interior portion of fluid. This gives additional facility for the formation of the adipose material in the cells of the olfactory organ, and thus disturbing the function of smell. In my own experience this has been so repeatedly observed that no difficulty arises as to the understanding of the various symptoms; and therefore the treatment follows of course.

Taste and smell generally are combined, but if we use taste in the popular sense, it is easy to understand how a blow, which is not sufficiently violent to do serious mischief to the anterior brain generally, may still suffice to tear the olfactory nerves, owing to their very small size, and their excessive softness. In only one recorded case of loss of smell from a blow on the head have I found mention of the exact part struck. The blow was on the occiput.

It will have been noticed that in each of these cases the patient complained of having lost taste as well as smell, there being no difficulty in recognising either acid, bitter, sweet, or saline. Pure taste is limited to the perception of these few qualities; and any additional perceptions than tactile which food may give us, are derived not from taste, but from the much wider sense of smell, and are due to irritation of the olfactory

nerves. We are so accustomed to the combination of simultaneous gustatory and olfactory impressions that we have come to look on the two as one, and, in popular language, have confused them together. But disease splits this compound sensation of flavour into its constituents, and leaves the olfactory or the gustatory element to stand by itself, according as the latter or the former set of nerves have been injured. So much larger a share of the compound is due to smell than to taste, that when a man has lost the former he thinks, as in these cases, that he has lost both; whereas, if smell remain, and true taste alone be lost —as sometimes occurs—the patient is almost regardless of his changed condition.

Doubtless we see from time to time cases which seem to stand in contradiction with the view Dr. Ogle had taken of the nature of flavour. These are cases in which the sense of *smell*, as tested by the application of odoriferous substances to the nostrils, seems entirely lost, while, notwithstanding this, the perception of *flavour* remains in comparative integrity. It is the existence of such cases which has caused physiological writers, as a rule, to define so hazily the limits of physical taste.

The cases are, however, not difficult to explain. It will invariably be found in them that the olfactory nerves and region are sound, and that there is a free access for odours to this latter through the posterior nares, while some hindrance or other prevents the

odours reaching it from the anterior nostrils; in other words, the sense of smell in these cases is not lost, but defects in the accessory mechanism prevent its being exercised in one of the usual ways, while they do not prevent its being exercised in another.

There are two modes in which we purposely smell at a substance. In the one we close the mouth and then take a long deep inspiration through the nostrils. During the inspiration the nostrils are widely dilated, so as to give as free an entrance as possible to the air-current. This, charged with odour, sweeps over the whole internal surface of the nose, the olfactory region included, and excites a sensation proportionate to its own intensity and velocity.

The second method is not quite so simple, but much more efficacious. Here, as before, we close the mouth, but instead of then taking one long deep nasal inspiration, we draw in the air by a rapid succession of short, shallow, but forcible "sniffs." If the nostrils be watched during the process, it will be seen that, so far from dilating as before, they actually contract at each "sniff," and a little attention will show that the contraction does not include the whole anterior opening, but only its posterior portion. At the same moment the cartilaginous sides of the nose may be seen to undergo lateral compression by the action of the compressor naris muscle; and by this compression, which is most strongly marked in the part answering to the small sesamoid cartilages, the

sides are brought slightly nearer to each other, and of course also to the central septum.

If the explanation I have offered be correct, it is plain how facial palsy must interfere with voluntary olfaction. With the first method, it interferes by preventing active dilatation of the nostrils; with the second, by preventing the lateral compression which is required to close the respiratory channel. At the same time, it will not materially interfere with the perception of flavours, for there is no hindrance to the passage of odours from the mouth upwards through the posterior nares.

Besides these cases of facial palsy, there is yet another class of cases, by no means uncommon, in which the perception of flavour remains, while the perception of odours by the anterior nostril is lost.

Here, again, we have an apparent contradiction to the statement that flavour is chiefly derived from smell. It is, however, not difficult to find an explanation. We have only to suppose, what is in itself highly probable, that the Schneiderian membrane has been so thickened by chronic inflammation as to bring the septum into contact with the middle turbinated bone, a result which, we have already seen, would require only an excessively slight thickening of the membrane; and secondly, that this thickening has not only thus cut off the olfactory from the respiratory channel, but that it has also obstructed the former and narrower of the two, the obstruction being

of such a kind as entirely to prevent the passage of air inwards, while it allows of the passage of air outwards. We must suppose that the projecting fold of membrane acts as a valve. That this is the case, is rendered almost certain by the fact that the expiration through the nose is much more free than is the inspiration.

Supposing, then, that this very probable anatomical lesion has been left as the result of chronic coryza, the apparent contradiction will be fully explained. The power of smelling through the anterior nostrils is gone, because there is no access through these to the olfactory region. The perception of flavours remains, because there is a free passage to this region from the mouth through the posterior nares.

Such facts, then, as these establish the opinion that flavour is almost entirely due to smell. On the other hand, other cases show that the only damage done was to the olfactory nerves, and did not include the gustatory or the glosso-pharyngeal.

Cases occasionally occur in which the soft palate adheres to the posterior wall of the pharynx so as to cut off all communication between mouth and nasal cavities. When this happens, not only is the power of smelling through the nostrils gone, but with it is lost also the perception of flavours in the mouth, though both nerves of taste and nerves of smell are in their integrity. When the communication is established, either spontaneously or by the surgeon's

aid, the perception of flavours and odours is at once restored. An example of this state of things I have recently had the opportunity of examining, through the kindness of Mr. Coulson, whose patient the man was, and one under my own treatment at the present time has been equally successful.

"Further, *a correspondence between the degree of nasal pigmentation* and the *keenness of smell* may, I think, be detected even in white individuals, by comparing one period of life with another. The olfactory sense is apparently but feeble in youth, children being notoriously dull in the perception of flavours, which, as already said, are chiefly derived from smell; whereas their perceptions of *taste* are as keen as those of adults, sweets attracting them, and bitters, salts, and acids being, as a rule, repugnant to their palates. Now, in all young animals the nasal pigmentation is much less intense than is the case in adults. So that here again the olfactory incompetence may not unreasonably be attributed to the deficiency of pigment."*

And this assumption is borne out by the observed fact that such a connexion does in reality exist

* Single examples are not worth much. Still it is interesting to note that Mohammed, the only historical personage, so far as I know, who was renowned for the excessive sensitiveness of his smell, was also remarkable for the deep blackness of his eyes and of his hair. His head, "even in advanced age, was sprinkled by only about twenty grey hairs."—See "Quarterly Review," October, 1869, page 303.

between the pigment of the eye and that of the neighbouring skin. For it has been stated by Geoffroy St. Hilaire, that in what are called "pied" negroes—that is, in negroes whose skin has become white in patches—the eyes are ordinarily without pigment if the skin of the ocular region be white; and, on the other hand, that if the skin of this part retain its ordinary tint, so also do the eyes. This persistence, then, of pigment about those parts of the skin from which the nasal cavities are developed, supplies another argument in favour of the view I am advocating. Examples of such persistence are endless. I may recal the well-known instances of black-faced sheep and black-faced cattle.

Neither of these are, however, what is called albino; for in both abundant pigment is present in the eyes. A more complete illustration is furnished by certain rabbits. In the variety known as Himalayan, not only is the skin and fur of the most snowy white, but the eyes are of the brightest pink.

Yet, even in these albinos, there are invariably patches of dark colour on the nose and ears. Knowing, as we do, how important a part is played by pigment in vision, we should have expected that the eye would have been the last part to surrender its colouring matter; whereas we find that, although very persistent there, the pigment is still more persistent in the nose and ears.

We now come to the final question—Is there any

conceivable mode in which we can imagine the olfactory pigment to affect the reception of olfactory impressions? In the eye we can partly understand how the pigment may act, but in the nose no obvious explanation is at hand.

There are, however, some observed facts respecting odours which, I think, may perhaps give us a clue. It has been noticed by several writers that dark substances absorb odours much more readily than do light ones.

"I have now nearly finished what I have to say of smell. I cannot, however, refrain from pointing out briefly that there seem to me to exist some grounds for believing that pigment plays a part even in the reception of auditory impressions.

"First, in the membranous labyrinth black pigment is found in varying amounts. As to the exact position of this pigment in man, and its relation to the ultimate nervous organs, nothing accurate has been ascertained. But in the labyrinth of certain fishes, the arrangement has been made out, and it is of importance to note that the relation here of the pigment to the ultimate nerve organs is identically the same as exists in the olfactory region of higher animals; so that the diagram of the one organ will almost stand for a diagram of the other. In each the ultimate nerve organs consist of certain cellular prolongations, and in each, interposed between these ultimate nerve organs, are pigmented epithelium cells. This simi-

larity of arrangement renders it highly probable that there is also some similarity of function. So that, if it be admitted that the pigment in the nose serves any purpose, it will be highly probable that the pigment in the labyrinth serves a like use. Secondly, we find among mammalia generally, the same tendency to retention of pigment in the skin of the ears, which I have already pointed out as existing about the nostrils; and the membranous labyrinth is developed by an involution of this external integument. Thirdly, in some animals there does most certainly exist a strange connexion between the amount of pigment in the body and the sense of hearing. Sichel pointed out many years ago, and Mr. Darwin made the fact generally known, that cats with pure white skin and blue eyes are almost invariably deaf. Should the perfect white be marred by a single blotch of colour, then the deafness is absent; or even should a kitten born without pigment, and therefore deaf, develope pigment at a later period, the deafness will cease. A white kitten was found by Sichel to be quite deaf. When it was four months old, the iris began to assume a darker tint, and with the development of pigment came, also, the sense of hearing."

Lastly, abnormal pigmental constitution is known to be frequently associated with partial or complete deafness. Dr. Laycock observed five cases of such association in a single family; and out of two hundred and forty-one deaf mutes at Berlin, Liebreich found no

fewer than fourteen to be afflicted with comparatively rare pigmental disease.

It would appear, then, not improbable that the organs of three main senses—sight, smell, hearing—require each, for the full performance of its function, the presence of pigment. One cannot, therefore, but be inclined to inquire whether they may not want it for some common purpose. In each of the organs the pigment is not contained within the nerve structures themselves, but lies external to these, and in immediate contiguity with their ultimate elements. Thus, in the eye, it is in contact with the cones and rods of the retina; in the nose, in contact with the olfactory cell processes; in the aural ampullæ, with similar cell processes, with the terminal bodies of the auditory nerve.

Now, in the case of the eye, Professor Draper has argued, that the image is not formed, as is usually said, upon the transparent retina, but on the screen of black pigment which lies behind. By this he believes the rays of light to be absorbed and converted into vibrations of heat, so that what was at first a light-picture, is now, so to speak, a heat-picture, in which each different shade and colour is represented by a different degree of temperature. "In this local disturbance of temperature," in his opinion, "the act of vision commences. The club-shaped particles of Jacob's membrane being truly tactile organs, communicate to the

sensory surface of the retina the condition of temperature of the black pigment." Doubtless, this view of Professor Draper's is not the current one. Admitting it, however, to be true, one cannot but ask whether a similar function may not attach to the similarly placed pigment of the nose and ear—whether this also may not serve to absorb vibrations of odour and of sound, and to convert them into vibrations of heat, which will affect the contiguous cells, in which, as we have seen, the olfactory and auditory nerves find their termination.

"This claims, of course, to be no more than a speculation, and even as such is open to one manifest objection. Physicists do not recognise the existence of any relation between the pigmentation of substance and its power of absorbing sounds. To this, however, I would reply that physicists, to the best of my belief, have not yet experimented on the matter, and that it is not impossible that such a relation may exist undiscovered, because unlooked for: just as a similar relation between pigmentation and the absorption of odours has lain for ages unsuspected, and therefore unknown."

Mr. Lewes, in his "Physiology of Common Life," has the following observations, which I quote here in support of the foregoing paragraphs:—

"*The Sense of Smell.*—The organ of smell is situated in the upper part of the interior of the nose. This much is certain; but the reader will probably be sur-

prised to learn that serious doubts are permissible as to whether the so-called olfactory nerves (the first pair) are in truth olfactory in function. Let us first take a general view of the parts supposed to contribute to the sense of smell, as represented in fig. 2, after Sömmering.

Fig. 2.

"From the base of the brain there issues on each side a long process, with a bulb at the end (*a* and *b*). This process is called the olfactorius. It is no longer regarded as a nerve, but as a portion of the cerebrum. It was thus also that Galen regarded it, not on very accurate knowledge, we must admit; and till the time of Willis this opinion prevailed. From Willis down to our own day the process was considered to be the olfactory nerve, until microscopic examination showed that it was not a nerve, but a ganglionic mass. The olfactory bulb (*b*) lies upon that part of the skull

named the cribriform plate. Through the holes in this plate some five-and-twenty smaller processes, called the olfactory filaments (b^1) descend, and ramify on the mucous membrane of the nose.

"To complete our survey of the organ, let us glance at the other nerves which enter the nose. At *e* we observe a twig of the ophthalmic branch of the fifth nerve, which has nothing to do with the sense of smell. At *c* is the fifth nerve, and the Gasserian ganglion c^1; and at *d* its superior maxillary division, sending off filaments which anastomose with the olfactory filaments. At *o* there are the twigs which supply the palate.

"All these are nerves; but whether the olfactory filaments are *nerves* is not, to my mind, absolutely certain; and whether they have any intrinsic relation to the sense of smell is even more dubious.

"If the olfactory filaments are really nerves, they are unlike every other nerve in the body. The bulb is a ganglionic mass, but the filaments which descend from it are unlike all other nerves issuing from the ganglia. They are neither formed of tubular fibres nor surrounded with the investing membrane (neurilemma), such as is found in other nerves, but with a very different membrane. They consist of a striped granular mass, not of distinct fibres. Nuclei are abundantly but irregularly scattered through this mass.

"This peculiarity in the structure of the olfactory filaments has been carefully investigated, and likened

to that of the grey or *gelatinous* fibres which Remak first discovered intermingled with true nerve fibres in the sympathetic system. These fibres, however, are by many recent anatomists pronounced to be peculiar forms of connective tissue, and not nerve fibres. Be this as it may, we must remember that the grey fibres only intermingle with ordinary fibres; they do not constitute the whole or greater part of a nerve: so that if the olfactory filaments are nerves, they are markedly different from all other nerves. Indeed, two recent writers, Seeberg and Erichsen, declare them to be formed of connective tissue, and not to be nerves. Bidder, their master, holds the same opinion.

"There is one fact which is almost decisive. We know that all nerves degenerate when the ganglion with which they are in connexion is destroyed. If, therefore, the olfactory filaments were nerves, they ought to degenerate after destruction of the bulb, and as they do *not* degenerate after destruction of the bulb, it is almost certain that they are not nerves."

Having thrown doubts on the nature of the olfactory nerves, I must now proceed to throw doubts on their olfactory function. The doubts are by no means new. Magendie thought he had proved by experiments that smell persisted after the nerves had been destroyed; but his experiments have been rejected, as proving nothing. Magendie said it would be important to ascertain whether the congenital absence of the olfactory nerves was coincident with the absence of

smell. "I do not know," he added, "that any such case has been observed." Hereupon, Longet replies with triumph, "In my 'Treatise on the Nervous System,' vol. ii. p. 38, may be read cases reported by Schneider, Rosenmüller, Cerutti, Valentin, and Pressat, in which the complete absence of smell coincided with a congenital absence of the olfactory nerves."* This answer seemed very conclusive to M. Longet, and may seem so to the reader until he reflects that the fact of a function being absent at the same time that a particular organ is absent, is no proof of a direct and absolute relation between the two; whereas if one case can be adduced in which the function was present, and this particular organ absent, *that* is categorical proof of the function not being dependent on the organ. One such positive would outweigh a hundred negatives. Magendie cited one case in which disease had entirely destroyed the olfactory nerves, without destroying the sense of smell.

But Bérard, who communicated the case, subsequently came to the conclusion "that the information respecting the olfactory sensibility of this patient, having been collected after the destruction of the nerves was ascertained, is far from reliable, and, I am convinced, was false."†

In cases of disease we are never certain as to the

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* Longet, "Traité de Physiol.," ii. 278. † Ibid.

precise effects, for we can never be certain as to the extent of the organic interference. But in cases of congenital deficiency we sometimes meet with instructive evidence; and on this very subject we can bring forward a case which has all the characters demanded by rigorous scrutiny, and reported by an authority of the highest eminence, Claude Bernard. When he was Magendie's assistant at the Collége de France, he commenced the dissection of the head of a woman who had died of consumption in the hospital. On opening the skull he was startled to find a complete absence of the olfactory nerves. Closer investigation showed that in all respects the brain was of the normal structure, its membranes and vessels normal, and the origin of all the other nerves perfectly regular; but of olfactory nerve, or bulb, there was not a trace. This was not a case of absence from disease, but of congenital malformation. This interesting anatomical specimen is still preserved in the Collége de France; and a figure, representing the brain and the base of the skull, is given by M. Bernard.*

In the presence of such a remarkable fact as this, M. Bernard naturally sought its physiological interpretation. He went to the persons with whom the young woman had lived for the last six months, and, without giving them any clue as to the object of his questions, interrogated them minutely respecting her modes of life, and her likes and dislikes, taking especial

* Claude Bernard, "Système Nerveux," ii. 232.

care to draw the conversation to topics which would elicit details respecting her sense of smell. From them he learned that "Marie found the odour of tobacco insupportable," and that "particularly in the morning, when she came into the room in which any one had been smoking over-night, her first act was to open the window to let out the unpleasant smell of stale tobacco—*la mauvais odeur de pipe renfermé.*" He learned also that she frequently complained of the fœtid smell of a closet which was near her room; and that for six weeks she officiated as cook, tasting sauces, &c., and being rather distinguished for her skill at it.

It is impossible to escape the conclusion that Marie really did possess the sense of smell, unless we suppose a conspiracy on the part of all these persons to state what they knew to be false—a conspiracy as incredible as it would have been idle. Even assuming an exaggeration in their statements, the particulars are such as force our belief that some degree of smell must have been manifested; and the presence of even a feeble function, in the complete absence of olfactory nerves, is enough to prove that the function in question cannot be that of those nerves. For observe, it is not a case of degree we have here; it is not a case of olfactory nerves partially destroyed, or incompletely destroyed; it is a case of entire absence of those nerves, ganglion and all; yet with this entire absence there is unequivocal evidence of the sense of smell being present.

M. Bernard remarks, that in no case hitherto recorded has the absence of olfactory nerves been *predicted* from the imperfection of the sense of smell, and this prediction subsequently found to be accurate, but that after the anatomical fact has been discovered, men have sought for proofs of the absence of a sense of smell in what nurses or relatives could narrate. "If," he says, "any one case can be shown me in which, during life, the physician has observed absence of the sense, and predicted a corresponding absence of the nerves, which prediction has subsequently been verified, I will willingly hold my case to be insignificant. No such case, however, exists." M. Bernard here seems to me more ready to concede the insignificance of his case than the philosophy justifies. However great a presumption might be founded on the successful prediction, it would still be very far below the value of such a case as that recorded by him.

This inquiry into the organ of smell has only interest for the student; the general reader must pardon its introduction—a pardon he can the more easily grant, since he has probably skipped the paragraphs devoted to the inquiry. Enough, then, if we know that the mucous membrane lining the upper cavity of the nose is the *seat* of smell; and as this part is also furnished with filaments from the fifth pair of nerves, we may conclude that these can serve the function of smell as their fellows can serve the function of taste.

The odorous substances are very numerous; but it

is indispensable that they should be in a gaseous or volatile condition before they can excite the sensation of smell. Musk itself, powerful as is its odoriferous property, would produce no sensation on the olfactory organ, if applied to it in a solid state; nor can liquids produce odours till they evaporate. Our distinguished chemist, Mr. Graham, contributes the following valuable note to Mr. Bain's work on the "Senses and the Intellect:"—

"Odorous substances are in general such as can be readily acted on by oxygen. For example, sulphuretted hydrogen, one of the most intense of odours, is rapidly decomposed in the air by the action of the oxygen of the atmosphere. In like manner, the odorous hydrocarbons are all oxydisable—the ethers, alcohol, and the essential oils that make aromatic perfumes. The gases that have no smell are not acted on by oxygen at ordinary temperatures. The marsh gas, carburetted hydrogen, is a remarkable case in point. This gas has no smell. As a proof of the absence of the oxydisable property, Professor Graham has obtained a quantity of the gas from the deep mines where it had lain for geological ages, and has found it actually mixed up with free oxygen, which would not have been possible if there had been the smallest tendency for the two to combine. Again, hydrogen has no smell, if obtained in the proper circumstances; now the gas, although combining with oxygen at a sufficiently high temperature, does not combine at any temperature endurable by human

tissues. It is further determined, that unless a stream of air containing oxygen pass into the cavities of the nostrils along with the odoriferous effluvium, no smell is produced. Also, if a current of carbonic acid accompanies an odour, the effect is arrested. These facts go to prove that there is a chemical action at work in smell, and that this action consists in the combination of the oxygen of the air with the odorous substances."*

In few things do human beings differ more widely than in their sense of smell; not only is the acuteness of this sense markedly different in different men, but of twenty men, having average susceptibility, perhaps no two will be found to agree in considering the same odours agreeable. Musk is very notoriously offensive to many persons; others do not like mignonette; some do not recognise any odour at all in a flower considered very odorous by others.

The *Iris persica* was found by Turner to have a pleasant odour by forty-one out of fifty-four persons, a disagreeable odour by one, and very little scent by four others. Of thirty persons, twenty-three held the *Anemone nemorosa* agreeable in its perfume, and the other seven did not think it smelt at all.

The uses of smell are important, and in animals much more so than in man. It is by smell that they are guided to their food; by smell they hunt

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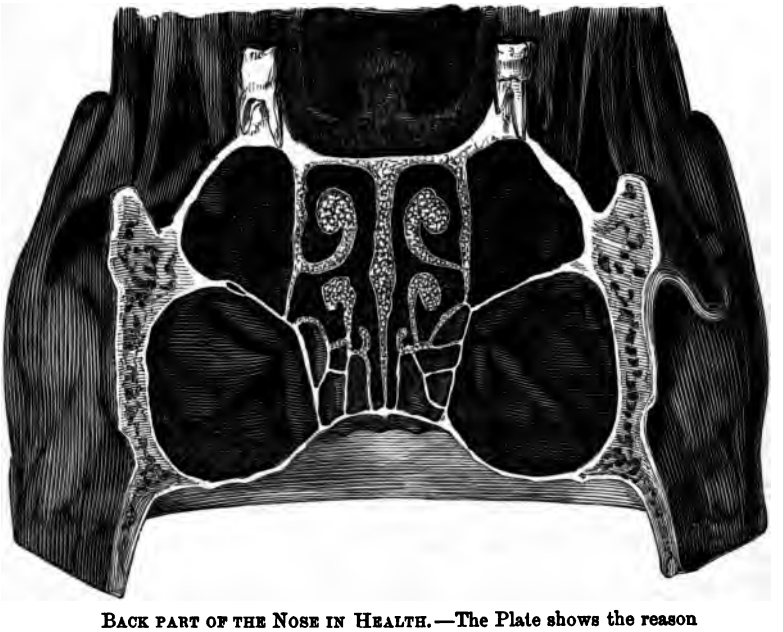
* Bain, "The Senses and the Intellect," p. 163.

their prey; by smell they recognise each friend or foe in the dark. That we are not endowed with keenness of scent is probably owing to the comparatively small exercise of that function in civilized life. Having so many other avenues of sensation, so many other modes of recognising objects, this one falls into abeyance, and becomes weakened from disuse. But in men with one or more of the other senses defective, smell is seen to be an important avenue to the mind; and in savages the keenness of scent notoriously surpasses that of civilized noses. James Mitchell was born blind, deaf, and dumb: yet by the smell he at once perceived the entrance of a stranger into the room. People who have a strong antipathy to cats, detect their presence by the odour in circumstances which would be thought impossible. A lady in my study one day suddenly remarked, "There is a cat in the room." On my assuring her there was none, she replied, "Then there is one in the passage." I went out to satisfy her. There was no cat in the passage; but on the first landing-stairs, looking through the railings, there, sure enough, was the cat.

The nerves which communicate the faculty of smell are the first pair, or olfactory. Each nerve expands in a bulb on the upper or perforated surface of the ethmoid bone, and its fibres proceed through the perforations, and spread themselves upon the membrane. It seems, then, that the effluvia from odorous bodies

act upon the expanded fibres in the nose, and are thence conveyed to the brain. By a like provision the power of smelling is seated in the entrance of the canal of the *lungs;* for thus the organ acts as a guard against noxious air, as the sensibility of the tongue is a guard to the stomach. That our nerves

FIG. 3.



BACK PART OF THE NOSE IN HEALTH.—The Plate shows the reason for the thickened speech and nasal intonation in cases of Corpulence, when the canals are obstructed with adipose tissue.

are the means of sensation is, from actual experiment, beyond dispute, but how they act, and how each class communicates its own peculiar sensibility, is a subject too mysterious for explanation.

The throat and mouth, to which reference has before been made, sympathize much in this condition of the mucous membrane, but it will be unnecessary to relate other cases. Some of the instances already recorded will be sufficient to confirm my views on the subject, and the propriety of the treatment which I suggest.

"That diseases of the nose may be caused or aggravated by irritation arising from the stomach is a proposition which will, I think, be readily granted. Indeed it seems surprising that the operation of this cause has been so little adverted to, since the phenomena which prove the fact are so well known.

"Are the monstrous noses, caused by excessive drinking of vinous and spirituous liquors, to be otherwise accounted for than by irritation arising from the stomach? And do not worms in children cause a teasing sensation in the extremity of the nose? I have seen in private practice several cases of irritation and swelling of the end of the nose, in some instances accompanied with small ulcerations of the pituitary membrane. In these cases the skin over the nose, which was tumid, became rough and discoloured; the middle of the discoloured part became sound, whilst the circumference retaining its morbid actions, the disease there spread in a small degree. In these cases the tongue was furred, and there were evident indications of disorder in the stomach and liver. The disease was checked and cured by attention to these

disorders. I was strongly impressed with the opinion that if these cases had been neglected, they would have terminated in that herpetic ulceration which so often affects the end of the nose. I have also seen several instances of that herpetic ulceration in its confirmed state more materially benefited by medical attention to correct the disorder of the digestive organs than by any local application, and I feel confident that it may be frequently cured by such endeavours."—ABERNETHY, "Local Disorders."

"I have observed in all the cases of that noisome and intractable disease, ozæna, which have come under my care lately, that the stomach and bowels have been disordered, and more benefit has been obtained by endeavouring to bring these organs into a healthy state than by all the local applications previously tried. I stated to a medical friend my opinions respecting one patient who came from the country, and begged to know the effect of the treatment which I had proposed. He informed me after some months that he had not been able to succeed in correcting the visceral disorder, and after relating the means which had been used, he adds: 'The patient was now attacked with a bilious disorder, to which she had formerly been subject, and for which treatment was adopted. She recovered the lost sense of smell and taste.'"

The eyes and ears, those outguards for protection, lose their acuteness and sensibility, or have their physical accuracy deteriorated, and the value of indi-

vidual life seems to fail. At this critical period, the meridian of life, it behoves the tenant to keep a strict watch over needful repairs, and, if he have a skilful medical architect, he may then obtain information respecting the best materials for keeping his building together, and on the fittest cements and supports to protect it against approaching storms.

The preventive art of medicine, and the suitableness of *diet*, are well worth considering, and in the autumnal season of life, they will be found to comprise the most rational and the most practical resources of information. For, without fear of contradiction, it may be asserted that the wholesome regulation of diet is as important as the administration of medicine.

In addition to these exertions of an experienced judgment, it is the indispensable duty of a medical practitioner to order the diet, and to adapt the special articles of food and drink to every vicissitude of health or disorder, local and general.

It is a true maxim in physic, that diseases which are long in their advancement are generally only to be remedied by *long continued curative attention.* Common sense points out the fallacy of expecting to eradicate old-established errors of the body by any sudden remedies, and the diet or medical regimen of such persons should be undeviatingly suited to their disordered tendencies.

Many of the diseases before alluded to, are

happily within the reach of medical skill, if attended to in time; but they are generally much more easily avoided by prudent regimen and preventive methods.

In speaking of disordered functions, I quote the following passage from Sir T. Watson's Lectures, vol. i.:—

"The sense of hearing is liable to analogous disorders. Sometimes it becomes preternaturally acute; and this is a bad symptom when it does occur. I was called a year or two ago to see a gentleman in the Temple. He had been taken ill only a few hours before, but I found him dying. The pulse was gone from his wrist, and his skin was cold. His intellect, however, was entire, and he complained of nothing but the distress he felt from the loud noises that were made by those around him in moving about and in speaking, although, in fact, all noise was as much as possible suppressed, and conversation was carried on in whispers; but his hearing was painfully acute. He died the same evening, I believe of an irregular form of cholera. It is always right that patients should be protected from the irritation which might arise from this source; for that degree of noise which would not interfere with the sleep of a healthy person, will often not only prevent it in a sick man, but will bring on delirium, and aggravate greatly the disease under which he labours. The custom of strewing the streets with straw before the houses of

those who are seriously ill is, in many cases, a very proper precautionary measure.

"The opposite fault, *obtuseness* of hearing, is much more common. Deafness is frequently attributable to some physical imperfection in the organ of hearing. But it is with cases in which it has a deeper origin that the physician is chiefly concerned. It often occurs in fevers, and is not then thought a bad symptom; it is certainly a much less unfavourable circumstance than morbid acuteness of hearing, and it probably depends upon a disordered state of the brain, which is not in itself very dangerous.

"What is called *tinnitus aurium* is an instance of the depravation of the sense of hearing. It seems sometimes to result from the too strong throbbing of the arteries. It occurs in many disorders, and is not unfrequently a symptom of diseased cerebral vessels, and a precursor of apoplexy or palsy. It is sometimes in itself extremely annoying. Curious and undefinable sounds are heard by some patients—sounds as of a rushing wind, as of the falling cataract, the ringing of a bell, or the beat of the drum.

"A female patient of mine in the Middlesex Hospital last year, who had disease of the bones of one ear, with symptoms that threatened some implication of the brain, affirmed that she heard a perpetual noise in her ear like the singing of a tea-kettle. I have lately been consulted by a gentleman from the country, who had no other complaint than a constant hissing, which

worried him greatly, in one ear. Another had watched with curious anxiety, and described to me very graphically the successive variations which this troublesome symptom underwent in his own person. It began suddenly with some headache. At first it was a loud roaring, like that of the sea. In a few days it came to resemble exactly the whistling of the wind among the trees in winter; afterwards he could have believed that the room was filled with humming gnats, and finally the noise settled down into the gentle sound of a distant waterfall. It haunted him incessantly for seven years. Then came an attack of shingles on the right side of his head, face, and neck, and the noise at once ceased. It left him free for a year and a half, and then returned as before. Sir David Brewster relates the case of a lady, subject to spectral illusions, whose ear was mocked by unreal sounds, as her eye by unreal visions. Being in her right mind, and perfectly aware of the infidelity of her senses, she repeatedly heard, not vague noises merely, but voices and sentences when none were uttered. This is far from being uncommon.

"Strange infirmities of the memory there are associated with cerebral disease, and justly to be regarded among its symptoms; large blanks in the backward gaze; fitful suspensions of the remembering power; partial glimpses of the past; resurrections of thoughts long buried in oblivion. I speak not of that natural decay of the memory which is noticeable in most

persons as age creeps on, and which is one of the most affecting of the many warnings then vouchsafed to us, that the bodily frame is suffering dilapidation. Even of this natural decay there are some curious things to be noted. Recent events are retained with difficulty and soon forgotten; while those of older date are easily and accurately recalled. This has been referred, and rightly I believe, to the differing degree of interest, and therefore of attention, which the same objects excite in the young and in the old. It would seem as if the effort of attention stamped characters upon the material fabric, which are deep and lasting in the youthful brain, faint and sooner effaced in the aged. But disease may revive things long forgotten—a language long unspoken and unthought in—or blot out entirely all traces of definite portions of time gone by, and even all previous power of speech and language. These latter symptoms are often present in cases of corpulence, and are too often neglected by the patient."

It would be foreign to the objects of this essay to enter minutely into the treatment of all the various secondary diseases occasionally accompanying corpulence. My intention is to refer to such practical hints as I have found essentially important, bearing in mind that the functions of the liver are primarily disturbed, and, in my opinion, *temporarily* metamorphosed in structure; to use a phrase to which one of the preparations of this organ made by Mr. Kier-

nan* refers, that the liver becomes, while the individual is under its excessive influence, an abdominal lung.

In order to convey exactly what is intended by disturbance of an organ, I would submit the following. The ultimate function of every organ is secretion. In health the excitement of this is duly proportioned to the want or the expenditure of the individual. If the excitant is in excess, the organ may relieve itself by increased secretion. If the excess be continued the organ on which it impinges will, after a time, cease to respond by any increase of secretion, or the formation of fat by the increased secretion of carbon from an error in diet or food, and will either transfer the eliminating action or whatever other term you may prefer, by inducing action in some other organ in compensation, or become itself the seat of structural change; in cases of a certain duration—both. This is how it happens that many kinds of food which, under habitually temperate, or even *occasional* increase, excite secretion, and are, in this way, made useful in many cases of inaction in an organ, become, in their *abuse*, certain excitants of disorder or disease. All this is in somewhat different senses true of rich food, fat, sugar, alcohol, starch, and all substances which hold to other organs the relation which these more commonly, perhaps, evince towards the *liver* and other *decarbonizing* organs. The pulmonary

* Kiernan on the Liver.

organs, most probably, are those acted upon under these circumstances.

The readiness with which one organ undertakes the functions of another, is in obedience to a conservative law, under which we can safely undergo a variety of changes which would be otherwise dangerous or impossible. So much for the use of this interchange. But in the absence of this interchange, although a state of freedom from danger or disease may exist for a time, yet one organ will not continue for an indefinite time to perform the function of any other without disorder, as commonly understood, or disease. Consistently with the foregoing, a very material element in constitutional treatment, of course, is the equalization of function amongst the various organs of the body. But it may happen in a given case that this is impossible from the presence of organic disease in some one organ. By impossible, I do not mean absolutely, but relatively to our present knowledge. This is an important distinction, because in practice it, according to my experience, makes an exception to a rule. The rule being to act on the primarily affected organ, wherever discovered; the exception being to act on organs secondarily affected, or otherwise situated, where the organ primarily affected shall have become diseased, that is, *temporarily* changed in structure, and as this is so often observed in the disorders under consideration, but little trouble is needed to fix upon the right mode of treatment.

That secretion, like every other operation in the animal economy, must for ever be involved in obscurity—how from the same animal fluid bile should be secreted by one organ, tears by another, muscular fibre by a third, and osseous substance by a fourth, has excited surprise, and the secretion, as it was hitherto supposed, of fat, not less than the rest.

In seeking for a cause and the allied concomitants and disorders of corpulence, we must look for it in a mal-assimilation of the digestive organs. The special treatment therefore must be governed by a regulated diet, to be varied of course as the circumstances of each case point out. I believe our failure hitherto has arisen from our not having been acquainted with the physiology of the liver, now made clear to us by the great discovery of Bernard, and more especially so, from our reliance on *specifics* handed down to us with no little air of authority, and adopted without much consideration as to their effects.

"The abuse of specific or special remedies," says Dr. Latham, "whether by physicians or by the world, is a heavy clog and drag upon the credit and fortunes of our profession. How it came to pass, and how it always has prevailed largely, and always will and must prevail, may be gathered from the explanation which has been given. Should this be deemed too much of an explanation, let its motive be its excuse; namely, that thoughtful physicians may be made more fully aware

how great the evil is, and may guard against it in their own practice, and discountenance it by their example, and thus hope to abate it a little. But they must never hope to put it down until they can persuade all their brethren to practise medicine wisely, and all the rest of the world not to practise it at all.

"Now, let us resume the subject of *cure* and special remedies where it was left off, and let us speak no more of their abuse. For have we not seen an obligation to use them in their own unaccountable success; and have we not seen within themselves promises and prophecies of future knowledge?

"The *specific* remedy and its certain *cure*, and the *special* remedy and its probable *cure*, will bear to be called 'great facts,' and indeed they are much to be admired. But to be so called and so thought of, they should bear the royal stamp—the stamp of experience. They should be current at sight among the wise and prudent, and pass with them for as good as gold. And, verily, such specifics and special remedies there are. But they are few; few and precious—precious in themselves and beyond themselves. For it cannot be that they should stand alone; they must have kindreds enough of worth and value, if we could but find them out."

The assimilating actions of the digestive organs, both primary and secondary, must necessarily occupy the attention of the medical adviser in the treatment of this disordered condition.

Although, writes Prout, the oleaginous aliments and tissues, whether viewed with reference to health or to disease, do not occupy the prominent place of the saccharine and albuminous aliments and tissues; yet, as all the more perfect animals evolve the oleaginous principle, we may conclude that its presence contributes in some way to the welfare, if not to the very existence, of the animal economy. Moreover, if this inference be taken for granted, we may also infer that, like the other staminal principles, the assimilation of the oleaginous principle, both primary and secondary, is not only liable to be deranged, but to give occasion to various secondary diseases. Now, such derangements and secondary diseases (of the nature of which, we must confess at the outset, we know much less than we ought to know) constitute the principal subject of the present inquiry.

The peculiar affections which we shall select as resulting from deranged assimilation of the oleaginous principle are—certain affections connected with an *excessive* or *deficient* quantity of oleaginous matters in the system; *obesity* and *leanness;* and certain affections connected with the *mal-assimilation of the oleaginous principle,* and producing derangements in the qualities of the principle, of which, as a particular illustration, will be given the history of *biliary concretions* or *gall-stones.*

The natural law of the deposition of fat varies

considerably at different ages, and in the different sexes. In children and in females, especially in early age, the chief seat of the fatty deposit is in the cellular texture immediately under the skin. During adolescence, the fat has a tendency to disappear from this situation; but about the middle age it frequently becomes again deposited not only in the subcutaneous tissues, but also in the neighbourhood of certain internal viscera. In a perfectly healthy individual, however, no abnormal deposition of fat can be supposed to take place, at any age or in any locality, provided the natural appetites and muscular powers be regulated as they ought. Whenever, therefore, we see an individual unnaturally fat or lean, we may safely conclude that an error exists somewhere; and that such an individual either inherits a propensity to disease, or is producing for himself such a propensity. The chief circumstances which seem to concur in producing derangements of the oleaginous assimilation are the following.

First, an inherited tendency as regards hereditary susceptibility. So many vague notions are entertained upon this subject, that it will be necessary for me to define the latitude in which the term is to be received. A disposition to become corpulent is certainly hereditary, but it is only hereditary in predisposition, always requiring the influence of some *cause* to produce it, and consequently always to be prevented, and often relieved by avoiding such excit-

ing cause. In cases of great obscurity, a knowledge of the disease to which the patient's parent is particularly liable, must, for reasons sufficiently obvious, assist our judgment as to the treatment. No one can doubt that certain families have a natural tendency to corpulence, which can be often traced through many successive generations. It is curious also to observe how this tendency is varied in different families, and even in different individuals of the same family. Thus in one family we see the children and females possess a striking tendency to *embonpoint*, while the male adults, particularly in advanced age, are as remarkable for their leanness. In another family directly the reverse may be observed, the children and females are lean, diseased, and squalid; while the middle-aged male adults are conspicuous for their corpulence. These, and other variations which might be named, doubtless indicate deviations from the normal state of health, which if carefully studied might throw no small light on the nature of many hereditary affections, at present but little known.

Other circumstances which seem to exert considerable influence on the deposition of fat, are *climate* and *locality*. The inhabitants of low swampy situations in temperate climates are usually remarkable for their bulky flabbiness and propensity to corpulence; while the inhabitants of very hot, and of very cold climates, as well as the inhabitants of mountainous regions, have perhaps less tendency to obesity. There is this remarkable difference, however, between the inhabi-

tants of hot and of cold climates; the inhabitants of hot climates can scarcely become fat without becoming otherwise diseased; while the inhabitants of cold climates seem not only to derive protection from the influence of the external cold, by the layer of fat with which their bodies may be enveloped, but the superfluous carbon of the fat, combining with oxygen, during the secondary assimilating processes, has with some reason been supposed to contribute to the production of animal heat. Many beautiful provisions illustrative of these observations might be pointed out, did our time and subject permit; we pass on, however, to the consideration of *diet* and *exercise*, two very important circumstances influencing the deposition of fat in animals.

Healthy individuals who spend their time in sleep, and in bodily and mental indolence, and who partake largely of fat and luxurious food, and of ale or other strong malt liquors, have at all ages a tendency to become corpulent. This tendency to become corpulent, however, is usually most remarkable about the middle period of life, when it is apt to terminate in gout, or some still more formidable disease: particularly if the individual persists in his indolent and luxurious habits.

The term *leanness*, as here understood, implies a simple absence of fat; and is not to be confounded with *thinness* and *emaciation*—terms expressing in different degrees the absence, not only of fat, but also of the gelatinous and albuminous tissues.

Leanness, when extreme, and when it cannot be referred to a satisfactory cause, must be accounted a disease. In such cases it is usually accompanied by more or less of thinness or emaciation—states of the system which, if not explicable on obvious principles, must almost always be considered as morbid.

Leanness, like obesity, depends either on predisposing or on exciting causes. That some individuals have a natural tendency to leanness, as others have to obesity, there cannot be a doubt. Moreover, such tendency to leanness often runs in families, and even descends through several generations.

The exciting causes of leanness, like those of obesity, may be considered under the heads of climate or locality; and diet and exercise. I know of no climate or locality, the inhabitants of which are naturally lean, except the inhabitants of mountainous regions may be said to be so. Leanness, more than from any other causes, results from deficient or innutritious diet; from the free use of acid liquors, as cider, &c.; from excessive bodily and mental activity; and from a variety of affections capable of deranging or suspending the primary assimilating processes, and thus of cutting off the supplies; the *modus operandi* of all which, and particularly of deficient and innutritious diet, and of excessive bodily exercise, is sufficiently obvious.

Another cause of leanness may consist in a natural

imperfection of the faculty of assimilating the oleaginous principle; or, as just stated, such imperfection may be induced by a variety of circumstances. This incapacity of assimilating oleaginous matters shows itself in a variety of ways. Thus there are some individuals whose *stomachs* will not tolerate the least portion of fatty matters; there are others who, though the stomach may tolerate fat, never fail to suffer from its use, by what is called bilious derangement. Such individuals are usually lean. On the other hand, there are individuals whose stomach will bear any quantity of fat with impunity, and who yet remain lean; or certainly, at least, do not become fat, however freely they may partake of oleaginous matters. These three conditions of the system undoubtedly depend on very different causes. The two first conditions, in particular, most usually occur in individuals of an anxious and nervous character; of great mental susceptibility and activity; and who, moreover, have suffered much mental affliction, real or imaginary. The first form, in particular—viz., the total incapacity of taking oleaginous matter in any state, I have once or twice seen connected with cerebral disease, which has subsequently proved fatal. In spare individuals, who take fat with impunity, the fat is either not assimilated at all, and passes through the bowels unchanged, as in many strumous individuals; or if the fat be primarily assimilated, the secondary functions dispose of it as

fast as it is deposited, so as to prevent its accumulation. This latter more particularly occurs in healthy individuals who take much exercise, or are mentally worried; and who under no system of diet whatever would become fat. As a general rule, perhaps, it may be finally stated that obesity is connected with disease of the liver, and leanness otherwise; but the preceding remarks will show that though this rule may be true in extreme instances, yet that, under the common circumstances in which mankind is placed in a state of civilization, there are numerous apparent exceptions to it.

Although the oleaginous principle, from what has been elsewhere, as well as above stated, seems less subjected to change in the primary assimilating organs than either of the other great alimentary principles, so that it is doubtful whether it be converted by the mere action of the stomach, &c. into albuminous matters; yet the case is very different with respect to the operations of the secondary assimilating processes on this principle. In those important secondary assimilating processes, for instance, which are constantly going on in all organized beings, and which cannot cease for a moment without the destruction of the being, the oleaginous principle obviously plays a very important part. Thus in febrile and other diseases, in which the primary assimilating processes are often entirely suspended, the rapid disappearance of fatty and other matters

from the system, and the consequent general emaciation produced, not only show that the secondary assimilating processes are even more active than in health; but that the fatty matter, in common with the other matters, is somehow appropriated to the purposes of the economy. The same appears from the phenomena of hibernating animals, which may be almost said to live on their fat during their dormant state. The exact changes which the fat undergoes during the secondary assimilating processes are unknown; but in whatever these changes consist, they are probably essential to the existence of organic life; and therefore of first-rate importance. That the production of animal heat is the only use of fat thus disposed of, as recently stated, I do not believe, for reasons elsewhere stated.*

That the oleaginous principle laid up in the great reservoirs in which it is deposited in animals partakes less of the character of a living organized substance than the other constituents of which bodies are composed, cannot be doubted; yet that fat, or some nearly allied principle, admits of the highest degree of organization of which matter is perhaps capable, is evident from the large proportion in which it enters into the nervous and cerebral tissues; one-fourth at least of the solid matters composing which tissues, is said to consist of

* Prout, "Stomach and Renal Disorders," p. 261. *Vide* also Niemeyer's Lecture, Appendix.

oleaginous principles. With the oleaginous are associated an unusually large proportion of phosphorus and other incidental mineral matters; the uses of which, as well as their states of combination, are absolutely unknown to us. The proportion of the nervous cerebral masses to the other soft parts of animals is comparatively small, but of course is different in different animals; as a general rule, the proportion is the greatest in the more perfect animals, in whom the brain and nervous system are the largest. Moreover, as the quantity of fatty matter in animals seems to bear an inverse relation to the quantity of bodily and mental—*i.e.*, of *nervous* activity—can the leanness proverbially produced by nervous activity be referred to the more rapid consumption, and consequent renovation from the oleaginous principle of the general mass of nervous matter? Further, is not extra-consumption of the nervous matter attended by the presence of a larger proportion of phosphorus in the urine? And cannot the occasional appearance of a large proportion of the earthy phosphates in the urine be referred to the same operations?

We have made these remarks for the sake of bringing together under one point of view the little we know of the general physiology, and particularly of the assimilation of the oleaginous principle. They are acknowledged to be very imperfect; but the remarks, incomplete as they are, may have the effect of drawing the attention of others to the subject; we shall,

moreover, have occasion to refer to some of them in subsequent parts of this essay.

Although obesity and leanness may, as we have seen, become of themselves diseases, yet in all their common modes of existence they are rather to be considered as *symptoms* only. A formal account of the treatment of obesity and leanness, therefore, is not necessary; and they much more naturally fall to be considered in connexion with those peculiar conditions of the system to which they usually belong as symptoms.

The history of my finding occasion to investigate this subject is as follows:—When in Paris, in the year 1856, I took the opportunity of attending M. Bernard's discussions on the views he was then propounding in relation to his now generally admitted theory of the liver functions. After he had discovered by chemical processes and physiological experiments which it is unnecessary for me to recapitulate here, that the liver not only secreted bile, but also a peculiar amyloid or starch-like product which he called glucose, and which in its chemical and physical properties appeared to be nearly allied to saccharine matter, he further found that this glucose could be directly produced in the liver by the ingestion of sugar and its ally starch, and that in diabetes it existed there in considerable excess. It had long been well known that a purely animal diet greatly assisted in checking the secretion of diabetic urine: and it

seemed to follow, as a matter of course, that the total abstinence from saccharine and farinaceous substances must drain the liver of this excessive amount of glucose, and thus arrest in a similar proportion the diabetic tendency. Reflecting on this chain of argument, and knowing too that a saccharine and farinaceous diet is used to fatten certain animals, and that in diabetes the whole of the fat of the body rapidly disappears, it occurred to me that excessive obesity might be allied to diabetes as to its cause, although widely diverse in its development; and that if a purely animal diet were useful in the latter disease, a combination of animal food with such vegetable diet as contained neither sugar nor starch, might serve to arrest the undue formation of fat. I soon afterwards had an opportunity of testing this idea. A patient who consulted me for deafness, and who was enormously corpulent, I found to have no distinguishable disease of the ear. I therefore suspected that his deafness arose from the great development of adipose matter in the throat, pressing upon and stopping up the Eustachian tubes. I subjected him to a strict non-farinaceous and non-saccharine diet, and the volatile alkali alluded to hereafter. In about seven months he was reduced to almost normal proportions, his hearing restored, and his general health immensely improved. This case seemed to establish my conjectures, which further experience has confirmed.

When we consider that fat is what is termed a

hydrocarbon, and deposits itself so insidiously and yet so gradually amongst the tissues of the body, it is at once manifest that we require such substances as will create oxygen and nitrogen to arrest its formation and to vitalize the system. That is the principle upon which the diet suggested operates, and explains on the one hand also the necessity of abstaining from all vegetable roots which hold a large quantity of saccharine matter, and on the other the beneficial effects derivable from those vegetables the fruits of which are on the exterior of the earth, as they lose, probably by means of the sun's action, a large proportion of their sugar.

I have some misgiving as to the importance of bread as an article of diet in the treatment of corpulence, which might be easily deduced from the principles upon which digestion of food in the stomach is explained. In addition to its nutritive qualities, it performs a mechanical duty of some importance. It serves to divide the food, and to impart a suitable bulk and consistence to it. It is therefore more necessary in these cases to conjoin it with articles containing aliment in a small space than where the food is both bulky and nutritive.

Where much acidity occurs, the bread should be toasted, or well prepared biscuit substituted. I have had occasion to observe striking changes in the urinary deposits produced by suspending the use of bread, and substituting toast in its place, this being

so prepared as to be thoroughly dried, and to carry with it on toasting a certain amount of charcoal.

In some of these disordered conditions charcoal is given with much success. It eases pain or occasional neuralgia of the stomach. It is markedly useful in flatulence. In the majority, if not in all cases, intestinal flatulence is the result of gases generated by fermentation. The symptoms accompanying flatulence, however, are not always alike, and their various combinations afford indications for other treatment. Sometimes "wind" is produced in large quantities with great rapidity, producing distension, eructation, and mental depression, the patient complaining only of these symptoms, not of pain nor of acidity. This enormous production of gas, irrespective of other symptoms, occurs most commonly in the middle of life. Great difficulty is often experienced in checking its formation. Vegetable charcoal, or toast, as before indicated, is one of the best remedies for this purpose. Sometimes after a few mouthfuls of food this gas is formed in a quantity so large that the patient is constrained to cease eating. Here charcoal should be taken immediately before each meal. Other patients are not troubled till half an hour or longer after food. In the latter cases charcoal should be taken soon after the meal; five or ten grains of vegetable charcoal is generally enough, and acts better administered with some solution of ammonia.

Whether we shall ever arrive at an exact knowledge

of the form and proportion of the internal organs which are the cause of corpulence I know not. Whenever we do so, I think it will be by means of observations on the relations which these several viscera bear to one another in the *healthy* subject, assisted probably by comparative anatomy. All that can be deduced from what has gone before is, that their lungs are probably not smaller than those of others, but, from some unexplained cause, are not capable of containing so much air; that the upper ribs are somewhat impeded in their motions, but the diaphragm not at all; that if our race resembles, as it probably does, cattle in the proportion of its organs, the livers of corpulent persons are likely to be larger than those of others.

The unburned hydrocarbon in these cases accumulates in the form of fat, and the unhappy subjects carry about with them a great weight of material which is simply an incumbrance to them, this great accumulation of fat again mechanically interfering with the movements of the chest, and also of the diaphragm, so that the respiratory changes and the pulmonary circulation are still further impeded, while the heart is embarrassed by the growth of fat upon its surface, and thus by these mutual reactions the evil is growing rapidly.

The liver is composed of arteries, veins, nerves, lymphatics, and excretory ducts, united by a peculiar structure. In every other gland in the body, the same blood which supplies it with nutrition is also

adapted to its secretory office, and is conveyed to the organ by the same vessel; but the liver requires *arterial* blood for its nourishment, and *venous* blood for the materials of its *secretion;* the *hepatic* artery supplies the former, and the *vena portarum* conveys the latter. This vein is formed by the concurrence of all the veins of the abdominal viscera, which gather together and constitute one large trunk, called the sinus of the *vena portarum,* which enters the liver and divides in the manner of an artery. This peculiar arrangement induced some physiologists to suppose, that the bile was prepared in the abdominal viscera, or rather that the blood underwent some peculiar modification in the intestines, which prepared it for the peculiar change it was destined to undergo in the liver; and they have supported this opinion by another, equally *gratuitous,* that the blood of the *vena portarum* is better adapted for the secretion of bile, on account of the larger proportion of carbon and hydrogen which it must contain; but Bichat has observed that bile, which is a highly hydrogenated fluid, does not require venous blood for its secretion; and contends that the bile is secreted from the arterial blood of the liver, since the quantity of the latter sent to the liver is more in relation with the quantity of bile formed than that of the venous blood, and that the volume of the hepatic canal is not in proportion with that of the *vena portarum.*

Dr. Flint gives a brief description of the physiolo-

gical anatomy of the liver, in which the observations of Kiernan, Sappey, Kölliker, Leidy, and a host of other and more recent writers are duly given. There can be little doubt now that the ultimate branches of the biliary ducts penetrate the interior of the lobules, and form exquisitely fine tubes between the hepatic cells. Some are of opinion that those passages are formed only by opposite and corresponding grooves on the surface of the cells, whilst others hold that a separate membrane is present. Dr. Flint tells us that a peculiarly favourable opportunity for investigating this point was presented in the livers of animals that died of the so-called "Texas cattle disease," which was taken advantage of by Dr. C. Stiles; and that, "in the examination of these specimens, the presence of what appeared to be detached fragments of these little canals is an argument in favour of the view that they were lined by a membrane of excessive tenuity."

In regard to the production of the secretion, Dr. Flint considers there are good grounds for believing that the liver-cells situated outside the plexus of origin of the biliary duct secrete the bile as well as *the glycogenic matter*, the former being taken up by the biliary capillary ducts, and thence discharged into the intestine. He does not consider there is any evidence in favour of the view held by Robin, that the liver is a fusion of two distinct organs, a biliary and a glycogenic organ. As regards the kind of blood from which bile is formed, he thinks the evidence at

present obtained is in favour of the view that it may be secreted from either *venous or arterial blood.* He gives the estimated quantity per diem at two pounds and a half. The chemical composition of the bile is then fully detailed, an extended consideration being devoted to cholesterine, which, as the author holds, and has performed a number of original investigations to prove, constitutes one of the products of the disintegration of the nervous tissue, and, after being taken up by the blood, is secreted from that fluid by the liver—a view which we are quite disposed to accept. A long chapter is then devoted to the glycogenic function of the liver, in which the evidences of the presence of sugar in blood are given. Dr. Flint agrees with Bernard, and is at issue therefore with others, in believing that "during life and in health the blood, as it passes through the liver and is discharged by the hepatic veins into the vena cava, contains sugar, which is formed by the liver independently of the sugar and starch taken as food." The question of the presence of sugar in the liver under normal conditions during life is a different matter; and Dr. Flint remarks that from his own experiments he has come to the conclusion "that those who adopt his views cannot consistently deny that sugar is constantly formed in the liver and discharged into the blood of the hepatic veins; nor can Bernard and his followers ignore the fact that the liver does not contain sugar during life; although, as has been shown

by M'Donnell, sugar appears in the liver in great abundance soon after death."

We miss any explanation of the mode of origin of sugar from albuminous compounds, or of the functions fulfilled by the sugar when formed; but apart from these points, and taking the phenomena of the origin of sugar from farinaceous compounds only into consideration, the following remarks seem to us to express with accuracy the views that are now generally received respecting the mechanism of the production of sugar in the liver:—"The liver first produces a peculiar principle, analogous to starch in its composition and in many of its properties, though it contains two atoms more of water, out of which the sugar is to be formed. The name glycogenic matter may properly be applied to this substance. It is, as far as is known, produced in all classes of animals, carnivora and herbivora; and although its quantity may be modified by the kind of food, its formation is essentially independent of the alimentary principle absorbed. The glycogenic matter is not taken up by the blood as it passes through the liver, but is gradually transformed in the substance of the liver into sugar, which is washed out of the organ as fast as it is produced. Thus the blood of the hepatic veins always contains sugar, though sugar is not contained in the substance of the liver during life."

These opinions and experiments of Bernard have been much canvassed, but I think their substantial

accuracy has not been disproved, and I therefore adopt them. I can bear testimony to their practical usefulness in the treatment of many diseases from observing the facts, and much is yet to be expected from them.

The majority of those engaged in practice still, I believe, look upon the liver as if the principal duty of this gland was nothing else than the secretion of bile. It is certain, however, that it does other work, little, if at all, inferior in importance to the formation of biliary matters, and quite as necessary to the maintenance of health. Its power of making, and storing up for a time within its cells, a material resembling starch, constitutes without doubt one of its most important functions. This no person will for a moment doubt, who takes the trouble of ascertaining, by experiment, the immense increase or diminution in bulk which the liver may be made to undergo in the space of a few days by such changes of diet as increase or diminish the amount of this starch-like material in its tissue.

The subject is one which I conceive to be of great interest, in a practical point of view; and on this ground I would solicit the attention of practitioners to the facts recorded in the following pages, especially those relating to the *Formation by the Liver of Amyloid Substance*. While I venture to hope that physiologists will also carefully consider the facts, I trust that those who differ from the theory here maintained, as to the ultimate destination of the amyloid

substance in the animal economy, will at least remember that I do not put forward my view with dogmatism, but as one keenly alive to the difficulties and delicacy of the question at issue.*

When criticising the opinion which I advance, as to the ultimate destination of the animal dextrine formed by the liver, some persons may still be inclined to cling to the notion that this matter is destined solely for the maintenance of animal heat, and that it is consumed in the respiratory process. To ask such persons to consider and reflect upon the facts connected with the disappearance of the amyloid substance from the tissues before birth, is the best reply that can be given to this objection. Although it must be admitted that causes, apparently very trifling, will give rise to saccharine transformation, yet, as a matter of experiment, the subject is one beset with difficulties, and requiring great nicety of manipulation. On the whole, however, I believe there is sufficient evidence to lead to the conclusion that, under circumstances of *perfect health*, transformation into glucose is not the normal destination of the amyloid substance formed so abundantly in the liver. May not this great organ form, with the help of the amyloid substance secreted in its cells, a nitrogenous compound, just as the muscles convert the amyloid substance contained in them into the highly

* M'Donnell on the Liver.

nitrogenous materials of muscular tissue? May not, in fact, the amyloid substance of the liver be the basis of an azotized material forming a constituent of the blood of the adult animal, as the amyloid substance of muscle is the basis of the material from which the evolution of muscular tissue is accomplished?

The importance of the foregoing questions I think cannot be overrated, and the practical deductions may be assumed as correct.

It is by the assistance of the microscope that we can reconcile this temporary change, so to speak; the liver in cases of excessive corpulence becoming a temporary abdominal lung, and the functions of this organ being in some measure suspended from effecting the metamorphosis of tissue needful to the economy—thus secreting less bile and an increase of glucose.

It will be observed that I have had the words perfect health printed in italics. The vexed question of the changes in the liver before and after death I shall not here advert to, as in this discussion I am only referring to cases of corpulence, and as I never in my experience saw perfect health in connexion with this altered condition of body, it is not likely experiment will for the present decide it.

As scarcely any two men look at a subject from precisely the same point of view, no man sees the whole at once; but the various phases involved in the different views often, in combination, give the subject

that integral form to future investigators, which no one individual may have had the good fortune to discover.

In the principles which I shall endeavour to sketch, however unassailable the conclusions arrived at may be in the abstract, the value of them to me is the power they afford of enlarging and improving what is understood by the "constitutional treatment of disease," and not only of disease, strictly so-called, but the conduct of all other injuries, and the reparative processes they require.

Although I have before alluded to the gradual waste of the body in diabetes, recently, however, my attention has been called to cases wherein corpulence has kept pace with the diabetic tendency, and for a time caused considerable doubt and not less anxiety. Exceptions like these are not frequent; but when they do occur, are extremely perplexing and highly important, as regards the treatment, in a practical point of view.

The following illustrations, taken from the writings of Dr. Prout on the subject, will suffice to confirm my own observations. In distinguishing between such effects consists the skill of the medical adviser, and requires a freedom from prejudice, and a patience in minute inquiry.

"*Emaciation* and *debility* are almost invariable symptoms; yet diabetes is not a disease peculiar to spare and feeble habits. For I have repeatedly met with it in individuals, from whose appearance alone it

would never have been suspected; and in several instances I have seen diabetes occur in unusually fat and powerful individuals. The first instance of this kind occurred to me in 1837. The patient was a middle-aged gentleman, who had spent many years of his life in India, from whence he had returned, I believe, on account of bad health. About the period of his return he informed me that he weighed twenty-seven stone, or nearly 300½cwt. When he consulted me a few months afterwards he weighed twenty-three stone. At this time he laboured under well-marked symptoms of diabetes; the urine was large in quantity, and very saccharine, the thirst was most urgent.

"He was put on the plan before detailed, and in a few weeks went on the Continent. Shortly afterwards, at Aix-la-Chapelle, where he had used the baths, he was seized with a violent nephritic attack with bloody urine, &c., apparently caused by a renal calculus; but none was observed. Nearly two years elapsed before I again saw him, when he informed me that he had rigidly adhered to my advice, and was quite well. His weight was now about twenty-one and a half stone.

"The specific gravity of his urine was 1·030; it was free from sugar, abounded in the common lithate of ammonia sediments, and was natural in quantity. The thirst had left him. He was able to take a great deal of exercise, and shortly afterwards went again to India. The second instance, which occurred about

the same time, was that of an athletic gentleman, about sixty, weighing upwards of seventeen stone. When I first saw him, the urine was much above the healthy standard, and very saccharine. He suffered also from constant thirst, &c. Under the plan prescribed, the urine soon became much diminished in quantity and the thirst less urgent; and he felt little inconvenience from either. He also gained considerably in weight, though the urine still contained sugar. This gentleman died soon afterwards from an attack of erysipelas brought on by an injury of the head. Another instance of diabetes occurred to me in an athletic and corpulent man whom I have not since seen. I learn, however, from his friends that he goes on without suffering much inconvenience; but whether the urine still remains saccharine, I have had no opportunity of ascertaining. I have also, as before observed, seen many instances of diabetes in corpulent middle-aged females."

Another very troublesome concomitant and attendant annoyance in corpulent people, is the formation of gravel and calculus, a disordered condition that has been familiar to me for some years, and I may state that, after the usual and long-continued remedies prescribed for its relief—viz., the mineral waters at home and abroad, the season residences at the various springs—often failing of success, making themselves profoundly uncomfortable for a period of two months each successive year—the well-directed dietary in

which the liver is more or less concerned comes to the rescue, in finally preventing the formation of these distressing concretions.*

Cases are not infrequent where the patient has deviated from the diet scale laid down, and a return of the gravel formation has been the consequence. This I have often observed. But I speak perhaps with some degree of confidence as to the value of this dietary regulation.

Sir H. Thompson has called attention to the formation of calculi, in a lecture on the prevention of gravel, the substance of which I here insert. This complaint being of great interest from a physiological point of view, as well as occurring frequently in corpulent subjects, I need not apologize to the reader for its introduction in this essay. The change that has come over the scene of late in the treatment of these troublesome disorders is little less than marvellous, and the surprise is that it has not been earlier adopted. That particular articles of food and drink have immense influence in producing that state of urine which leads to the deposition of the crystalline matter, consisting in the great majority of cases of

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* The latest researches upon the place of origin of urea, and especially the beautiful experiments of M. Gréhaut, have demonstrated that the kidneys are by no means secretory, but purely excretory organs for urea. Dr. Cyon, in a late number of the *Centralblatt*, publishes a few facts in the form of a provisional communication to show that it is probably produced in the liver.

lithic acid, or one allied intimately to it, is beyond doubt.

"Now let us ask what is the real pathology of these cases, and then I think I shall be able to show you a more efficient remedy. The problem has presented itself to me with great force and frequency, because people, naturally fearing they may arrive at the stage of calculous formations, come for advice in the earliest stages, and with the strongest desire to avoid the advanced one of stone in the bladder. So far from sending them to Vichy or giving them alkalies, I believe they can be more effectually dealt with by a different mode of treatment. Let me premise, in broad and simple terms—as our time here, and, I may perhaps add, the extent of our knowledge, will not permit me to be more minute or exact in detail,—that the origin of what we call gouty symptoms, as well as of a superabundant uric-acid deposit in the urine, is due to defective assimilation on the part of organs associated with or forming the primæ viæ. I am quite aware that it is common in practice to speak somewhat knowingly of the liver, its actions and its states, although we have still to learn a good deal about all this. Some years ago we talked and acted as if we were thoroughly acquainted with the liver and its functions; but during the last fifteen or twenty years new light has been thrown upon the subject by Bernard, and we have learned that the more we inquired the less did we certainly know of its natural functions, still less of

its action in disease. Thus, if one thing was more settled than another, at least since the time of Abernethy, it was that mercury had a specific influence on that organ; but now we find there are grounds for believing that the action supposed has no existence at all. There were other things, indeed, which were vaunted to take the place of it, but no one ever thought of disputing the fact that you could augment the bile secretion by administering mercury. I am not here to say whether that is so or not, but it seems to have been proved that there are substantial reasons for doubting if our ancient faith in that dogma be tenable. In speaking, then, of the "defective action of the liver," or of "torpor of the liver," I merely use provisional terms, which most understand as indicating more or less distinctly a certain set of symptoms. Let them be briefly described as mainly consisting of a constant, or almost constant, deficient excreting function by the bowels, sometimes, but by no means always, associated with impaired appetite and slow or uneasy digestion; these latter being often absent if the diet is carefully selected, or if the patient lives in the open air and takes much exercise. On the other hand, considerable and multiform symptoms of disturbed digestion may be frequently present. I cannot positively state whether those phenomena are really due to inactivity of the organ in question; practically, for us to-day; this does not signify much, but the current terms are still convenient formularies until

others can be substituted for describing the condition in question.

"Now, at the bottom of this tendency to uric-acid production there often lies what is thus understood as inactivity of the liver; and the true *rationale* of the undue formation of the urinary salts appears to be that, the liver or some allied organ not doing its duty as an excreting organ, the kidneys have more work thrown upon them. Thus the solid matters of the urine, or rather some of its ordinary constituents, are augmented,—not all of them, for urea is not necessarily increased, but uric acid is largely produced, and is eliminated not only in solution but in crystalline forms. Uric acid is very insoluble in water; and although the quantity thrown out may be quite soluble at the natural temperature of the urine (100° Fahr.), when this diminishes to 60°, 50°, or 40°, the acid is deposited; and when the quantity is still larger, even the ordinary amount of fluid associated with it at a temperature of 100° will not suffice to dissolve the whole, and solid uric acid is deposited in some part of the urinary passages. This deposit may take place in the kidneys themselves, giving rise, if not thrown off, to the formation of calculus, at first renal, but sooner or later mostly becoming vesical. Now, if all this be so, the formation of uric-acid gravel is not by any means to be regarded as necessarily disease of the kidney; on the contrary, it is the result of an active and capable organ vicariously relieving some other

organ which is torpid. The true remedy therefore is, not to stimulate the kidneys, already overworked—not, to use a familiar simile, to spur that horse of the team which is already doing too much work, but you are to seek the cause in that other one of the team which is doing deficient work, and that is almost invariably the liver, in the sense already explained.

"The treatment, then, which I advise you to pursue is to employ such agents as will stimulate the excretory action by the primæ viæ without depressing vital power. No doubt that a powerful agent for the purpose is mercury; and it is quite unquestionable that the relief of the symptoms above alluded to is to be obtained in a remarkable manner by occasional small doses of that drug. For our purpose, however, it is neither so successful in action, neither can it be considered so harmless, as another class of agents, which in these cases I believe to be in every way superior—I mean certain kinds of natural mineral waters. These I also regard as superior in these maladies to taraxacum, nitric acid, alkalies, and the other substitutes, as they have been termed, for mercurial remedies, in promoting the function of the liver. The mineral waters which I refer to belong to a group of springs all containing sulphate of soda, and some of them sulphate of magnesia also, in solution. In studying these waters, I wish you to look with me at the composition of them, and at the same time to dismiss from your minds entirely those views of medicinal

doses which you have acquired in the dispensary, and which necessarily belong to it, since small quantities of drugs, as they exist in mineral waters, will act more freely than will those quantities combined after the ordinary pharmaceutical method.

"Here is a table of the waters which I refer to, with a comparative synopsis of their distinguishing saline contents, representing the number of grains (without chloride of sodium and other less active agents) in an English pint. Below these I add two well-known alkaline waters.

—	Sulphate of Soda.	Sulphate of Magnesia.	Carbonate of Soda.	—
Saline:				
Püllna	154 grs.	116 grs.	—	
Friedrichshalle	58 „	49 „	—	
Marienbad (Kreuz) .	48 „	—	9 grs.	Little iron
Carlsbad (Sprudel) .	25 „	—	13 „	
Franzensbad	30 „	—	6 „	Little iron.
Alkaline:				
Vichy (Celestins) about.....	3 „	—	47 „	Little iron.
Vals (Magdeleine) about	—	—	65 „	Little iron.

"The most powerful of this group is that of Püllna, which contains 154 grains, or nearly 2½ drachms of sulphate of soda to the English pint, and nearly 2 drachms of sulphate of magnesia. Those quantities

would give a tolerably efficient purge to anybody. But you must not give a pint of Püllna; 5 ounces would be a full dose. I do not like Püllna generally for our purpose, because it purges too freely, often gripes, and is very nauseous. Half a drachm of sulphate of soda and half a drachm of sulphate of magnesia in this form is too much for many people. I therefore recommend Friedrichshalle, which contains not a drachm of sulphate of soda in a pint, and little more than three-quarters of a drachm of sulphate of magnesia. Nevertheless, you would not think of giving a pint; eight or nine ounces make an efficient purge; for many persons six or seven suffice. I think I may say that seven ounces is an ordinary average dose. If you take seven ounces of Friedrichshalle water an hour before breakfast, and soon after a cup of hot tea or coffee, you will have a full, free action of the bowels; perhaps two. That, you see, would be about twenty-five grains of sulphate of soda and twenty grains of sulphate of magnesia, which, taken in any combination you like out of a druggist's drawer, would have no appreciable action; you might be a little uncomfortable perhaps, but there would be no action of the bowels. To repeat what I have said: if you evaporate a quantity of Friedrichshalle water in a warm water bath, and obtain as perfect a product as a chemist can produce, and administer four times the amount of salt in that form which exists in a dose of the natural water, you would still not have such

efficient or such certain results as from the small quantity (in the natural water) named above. So that there is something, which I do not pretend to explain, and certainly shall not speculate about here, which distinguishes the action of mineral waters from the action of salts which are produced pharmaceutically. The next water on my list is Marienbad, which contains no sulphate of magnesia, forty-eight grains of sulphate of soda in the pint, with nine grains of carbonate of soda, and a small quantity of iron. About half a pint produces for most persons an easy motion. If this water is exposed to the air for a day or two, there will be an obvious brown deposit of the iron, and it may be regarded as slightly ferruginous, though that is a secondary character. The next is Carlsbad with its many springs, all of which contain about 20 grains of sulphate of soda and 13 of carbonate of soda in the pint. Then we come to Franzensbad, which contains 30 grains of sulphate of soda, 6 of carbonate, and a little iron, which Carlsbad does not. That closes this group of springs.

"But now I shall just point out the distinctive characters of the alkaline waters which are so popular in this country. First, Vichy, which contains only 3 grains of sulphate of soda, but nearly 50 grains of carbonate of soda, in the pint—a powerful solution. Then we come to Vals, which is also from the volcanic district of France, some of the springs of which contain upwards of 60 grains of carbonate of soda, and

nothing else worth mentioning. These two waters are extremely famous, and are much resorted to against gout and gravel. Under their use the uric acid deposits disappear—that is, they are dissolved by the alkali. Inasmuch also as this appears to have some beneficial action on the liver, a certain degree of permanent benefit is perhaps also attained. Thus such patients are often better for a time after a visit to Vichy; but, as a rule, are not permanently benefited. I am satisfied, after observation on the spot, and on the effect of the waters here, that they only temporarily mitigate the complaint, and do not cure it. Now, the principle upon which the waters of Friedrichshalle and Carlsbad are beneficial is, that they produce activity in all the digestive functions, and thus waste matters which have been hitherto thrown out as uric acid by the kidney are eliminated in some other form. And thus it is that, if it be necessary to send these patients abroad, I prefer very much Carlsbad to Vichy, provided always that the subject of a Carlsbad course must not have become too weak, as for a time it makes a demand on the strength not well supported by a feeble person. Generally, however, this is not at all the condition of those who are passing uric-acid gravel. I believe that a short course of Friedrichshalle first, followed by Carlsbad, or by a combination of the two, produces the best results in these cases. This method has, at all events, been more successful with me than any other. Such a

course should be continued, according to circumstances, for six or eight weeks.

"A few words upon the way in which you should give them. If you have a patient coming to you whose digestion is not good, complaining of foul tongue, with deranged digestion and loss of appetite, it is sometimes, not always, desirable to give first a single dose, no more, say three or four grains, of blue pill at night, and the next morning eight or ten ounces of Friedrichshalle water, so as to ensure good action at first. Then commence with Friedrichshalle combined with hot water, one dose every morning an hour before breakfast, diminishing a little the quantity every day or every few days. One of the characteristics of this water is that the longer it is taken the smaller is the quantity necessary to effect the purpose. If, for example, seven or eight ounces taken in the morning, say with five ounces of hot water, produce one active movement of the bowels immediately after breakfast, the next morning six or seven ounces will do the same, and the morning after probably five or six ounces; and it is very likely that at the end of three weeks the patient will from four ounces experience the same effect produced originally by seven or eight. But after you have given it thus for one, two, or three weeks, according to the nature of the case and the results, you should combine it with Carlsbad, say three or four ounces of the former and five or six of the latter, with three or four of hot water every morning.

When Friedrichshalle is given alone, and also when it is mixed with Carlsbad, 20 or 30 per cent. of hot water should be added, that it may resemble somewhat the original condition at the spring. Friedrichshalle is naturally hot, and is evaporated on the spot to a small extent, being regulated and rendered uniform by stopping the process when the water reaches a certain specific gravity. Carlsbad, which at the spring is too hot to drink until cooled, should, when taken alone and unmixed, be raised in temperature to 90° or 100°, by placing the tumbler containing it in a vessel of hot water for a few minutes. After giving this combination of the two waters for two or three weeks, six, seven, or eight ounces of Carlsbad may be taken alone for another fortnight perhaps. The quantities given are considerably less than those administered at the spa itself, where a patient's stay is necessarily limited as to time. I am quite satisfied that the smaller quantity here recommended, and employed for six to nine weeks, instead of the usual three weeks of a foreign course, is better for a majority of the patients we have to deal with. The same quantity of water given there in 21 days, producing often notable loss of weight and power, will, if given here in 50 or 60 days, attain the object as certainly and more safely. I by no means dispute that there are other cases which may be benefited by the more heroic plan adopted on the spot. I have largely and systematically employed these agents now for seven or eight

years, modifying the quantity and the mode as experience has indicated, and the course thus briefly described is the result of it. The course may be repeated with advantage, if necessary, for most patients after an interval of three or four months. Meantime, as an occasional aperient and a corrector of digestion for these patients, I know nothing equal to Friedrichshalle.

"I will advert briefly to the subject of diet, certain restrictions in which are extremely important. It used to be said that when uric acid is largely deposited the nitrogenous elements of the food should be considerably diminished. I do not find in practice that a strict application of this rule is advantageous. On the contrary, the diminution of the deposit is more certainly attained by a course which is almost the opposite of that. There are three classes of aliments which must be permitted to the patient very sparingly, in order to attain the end in view—viz., *alcohol, saccharine and fatty matters.* First, alcohol: any fermented liquor permitted as an article of diet should be selected in its more diluted and in its most pure form. Believing that form in which it is found existing in natural wines to be usually the best, I would advise a light sound Bordeaux or a Rhine wine of similar quality, the former perhaps agreeing better with most persons. You will forbid Champagne, as for the most part imperfectly constituted, and always bad if containing much liqueur. The stronger

wines, as sherry and port, are mostly unsuitable, and strong beer is to be absolutely forbidden. Solutions of pure spirits and water are exceptionally desirable for some few persons with weak digestion. Secondly, *sugar in all its forms; at every meal and wherever met with, forbid it altogether.* Thirdly, let fatty matters, butter, cream, and the fat of meat, whether simply cooked or in combination to form pastry, be taken very sparingly. I cannot enlarge on the theory on which this advice is given. Suffice it to say that abstinence from the substances named probably lightens considerably the work of the liver, and so lessens the vicarious labour of the kidneys in accordance with the views already propounded. Let me just advert, moreover, to the dietetic system at Carlsbad. In recognition of some such principle there, no doubt, the use of sugar and of butter is absolutely forbidden during a Carlsbad course; and were you patients there, your purveyor would not supply you with the forbidden food, however much you might demand it. I can only say, as the result of observation, that this system, much more than the elimination of meat from the dietary, will reduce the uric acid deposit. If you will cut off a portion of alcoholic stimulant when necessary, and it often is so, will forbid everything that contains sugar, and diminish considerably all fatty matter—giving nitrogenous food, in fact, eliminating hydrocarbons—you will generally accomplish more than by the contrary method.

In addition to all this, you will of course see that the patient takes daily a fair amount of exercise in the open air, and that he protects his skin and encourages the performance of its functions by habitual ablutions and sufficient clothing. These points I can only name; but they are essential concomitants to the rest.

"Well, then, it is this system of diet and regimen, and the occasional systematic employment of the mineral waters named, which mainly constitute the treatment I strongly advise for the purpose of checking calculous disease in its early stages, and so to prevent the formation of stone in the bladder in that considerable majority of cases which are due to uric-acid formation and its consequences."*

Before any suggestions are offered in reference to the treatment of corpulence, it may be useful to some of my readers to be informed of a few circumstances relative to the anatomy and physiology of the deposition called fat, and of the nature and properties of the substance, the increased deposit of which is so injurious to the functions of life. This I shall do as concisely as possible.

The manner in which fat is distributed over the body is now generally understood to be by the texture of the cellular membrane. Formerly, it was supposed

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* Dr. Tuson, of the Indian Army, fully concurs in the above remarks.

that it merely adhered in clusters to the parts where it was found.

This membrane is thicker in some parts than in others, and is everywhere composed, as it expresses, of a number of cells communicating with each other. Some have thought that the fat was contained in cells peculiar to itself, on which account the name of adipose has been given to that part of the membrane in which it is found. The other has been called reticular cellular substance, and is considered as the universal connecting medium between the larger and smaller parts, extending itself to inconceivable minuteness, and constituting, according to the opinion of Dr. Hunter, one-half of the whole body.

That celebrated anatomist in his lectures always described the fat as contained in little bags of its own, not communicating with each other. He observed that if pressure was made on the adipose membrane the oil did not recede into the surrounding cells, as water did in anasarca; and that water was often seen in parts of the membrane where fat was never found. This, however, would prove no more than that in the economy of the system certain parts only of the cellular membrane are constituted to admit the deposition of fat. The fat, though, from its transparency in the living subject, it may appear fluid, is certainly not to be considered as oil. If it were, it would probably descend like water.

The quantity and quality of fat varies according to

the age, as before stated, and the parts in which it is deposited. It is firmer and higher coloured in old persons than in young ones. It is also more condensed and solid in parts liable to compression than in the omentum, or about the heart, stomach, and intestines. In children the fat is distributed over the surface of the body; but as we grow older it diminishes on the surface in proportion as it becomes deeper seated.

It is supposed that a person weighing one hundred and twenty pounds generally contains twenty pounds of fat. The accumulation of fat, or what is commonly called corpulency, and by nosologists denominated *polysarcia*, is a state of body so generally met with in the inhabitants of this country, that it may exist to a certain degree without being deemed worthy of attention; but when excessive is not only burdensome, but becomes a disease, disposes to other diseases, and to sudden death.

The *treatment* of obesity would now seem to rest upon a more sure basis than it has hitherto done, the investigations pursued by Dr. Dancel having been somewhat instrumental in leading to this result. In proof of the truth of this remark, we may look back for a moment to the curative agents formerly in use. Thus we find a tolerable list of remedies in the pages of Maccary, which includes—bleeding from the arm or jugular vein, leeches to the arms, dry cupping, prolonged blistering, vegetable diet with vinegar, acids

(except nitric and phosphoric), hot baths, salt-water baths, baths of Aix, Spa, Forges, Rouen, and occasional starvation, decoction of guaiacum and sassafras, scarifications, salivation, grief and anxiety to be induced, purgatives, issues, pricking the flesh with needles, walking with naked feet, and removal of exuberant fatty tissue with the scalpel. Since this ridiculous catalogue was published, Turkish baths, sea-voyages, very little sleep, emetics, digitalis, soap (a relative of Mr. Wadd's ordered a quarter of a hundredweight of Castile soap for his own eating), salt, mercury to salivation, the inhalation of oxygen gas, purgatives, diuretics, the extract of the fucus vesiculosus, and preparations of bromine or of iodine have been freely tried.* But all these plans, however perseveringly carried out, fail to accomplish the object desired, and the same must be said of simple sobriety in eating and drinking.

The explanation of all this is very simple. Food consists of azotized or nitrogenous and non-nitrogenous principles. The *former*—the nutritive or plastic class—includes all fibrous and albuminous matters, such

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* Wadd has also told us that "among the Asiatics there are Brahmins who pride themselves on their extreme corpulency. Their diet consists of farinaceous vegetables, milk, sugar, sweetmeats, and ghee. They look upon corpulency as a proof of opulence; and many arrive at a great degree of obesity without tasting anything that has ever lived."

Dr. Fothergill stated that a strict vegetable diet produces exuberant fat more certainly than other means.

as animal food; these matters aiding the formation of blood and muscle, but not entering into the composition of adipose tissue. The *latter*—the calorifacient or respiratory class—consists of oily and fatty matters, with sugar, gum, starch, and vegetable acids, all of which contain carbon and hydrogen, the elements of fat. Man undoubtedly requires a mixed diet; that is to say, nitrogenous food is needed for the formation or renewal of the tissues and other nitrogenous parts of the body; while the respiratory food is required for the production of the fatty components of the body, and as affording materials for the respiration and the production of heat. Hence it is clear that while we may limit the non-azotized substances, they must not be altogether cut off. Moreover, it is of practical importance to remember that the elements which are chemically convertible into fat are rendered more fattening if alcoholic liquids be added to them in the stomach, probably because of the power which stimulants possess of lessening or delaying the destructive metamorphosis. It may be said that a diet such as I recommend is calculated to induce lithic acid diathesis with gout. The only answer is, that I provide against this occurrence by a draught of ammonia and magnesia taken early in the morning. Moreover, as a matter of experience, I have found no indication of gout to follow this treatment; and in cases which I have successfully treated according to these rules, not the slightest symptom of the kind occurred.

But even should an attack of gout result, it is really a disease of minor importance compared to obesity, except as a confirmed affection.

It only remains to say that every patient under treatment for this disease should be regularly weighed, while the condition of his health is to be carefully watched. Particular heed is to be taken that the appetite does not fail, the power of digestion fall off, constipation take place, the action of the heart become enfeebled, or the blood get impoverished. On the part of both physician and patient, firmness of purpose and steady perseverance will be needed. As a rule, the diminution should not be allowed to progress more rapidly than at the rate of one pound a week, *and it ought not to be carried to too great an extent.*

The consequences of obesity are often more serious than is generally believed. To put aside many minor inconveniences—which, however, may be sufficiently annoying to make the sufferer desirous of reducing his weight, even at some risk of his health—it may be taken as a general rule that obesity does not conduce to longevity. Aristotle says that "fat persons age early, and therefore die early." As a mere statement of fact, this is true when tested by averages; but it is important to remember that obesity may be either the cause of an early death, or merely a warning that a tendency to premature decay exists; in which latter case the time given for treatment may allow of the happiest results being produced. The functions of various im-

portant organs being constantly impeded must cause many distressing disorders. As a rule, to which every one can call to mind exceptions, excessive corpulence diminishes both bodily and mental activity. One of the most anomalous cases is mentioned by Maccary, who states that he met at Pavia the most enormously fat man he ever saw; but who, nevertheless, was a dancer, and was exceedingly agile and graceful in his movements. But generally obesity is accompanied with diminished vital power; there are disturbances of the organs of respiration, circulation, and digestion; the blood is proportionately deficient in quantity or quality, the muscles are weak and have but little firmness, while the countenance is bloated and sallow. And although the disposition is often sanguine, so that the sufferer continues lively and cheerful, and has the happy habit of looking at the best side of everything; yet active mental occupation is generally as uncongenial as repose and idleness are in harmony with the inclinations. Lord Chesterfield is no great authority; but he mixed much with men, and in his opinion fat and stupidity were such inseparable companions, that he said they might be used as convertible terms. It is a common prejudice that fat persons are slow of intellect, and the provincial epithet of "fat head" sufficiently expresses the popular idea of the mental powers of the corpulent. But there are plenty of instances which conflict with this view; and I need only mention David Hume and Napoleon to convince

everyone that it is not universally true. Raggi, an Italian physician, who was a great authority on corpulence, relates many cases of extreme corpulence in which the intellect remained quite alert to the last. Many of us were acquainted, from personal observation, with the huge bulk of that remarkable man Dr. Woolff, the Bokhara missionary, one of the fattest of men, and whose intellect was a marvel of restless activity.

Fats are obtained abundantly from both the animal and vegetable kingdoms. Their predominating elements are carbon and hydrogen. They never contain nitrogen, except as an accidental ingredient. They are made up of three closely allied bodies—viz., stearin (*στέαρ*, suet), margarin (from its lustrous appearance, *μάργαρον*, a pearl), and olein (oleum, oil) which is fluid. When fatty matters are heated with the hydrated alkalies, they undergo saponification, during which process a viscid sweet fluid, glycerine (*γλυκὺς*, sweet), is yielded. Now several physiological studies lead to the conclusion that oils and fats may not only be formed in the system from food which contains it ready prepared, but also from chemical transformation of starch or sugar. Many experiments have been made on geese, ducks, and pigs, which have proved that these animals accumulate much more fat than could be accounted for by that present in the food. M. Flourens had the bears in the Jardin des Plantes fed exclusively on bread, and they became excessively fat.

And several authors have shown that bees form wax, which strictly belongs to the group of fats, when fed exclusively on purified sugar.* If with foods of this nature the animals be subjected to a warm atmosphere, and allowed but little room for movement, the adipose tissue rapidly gets increased. At Strasbourg, the place of all others most noted for its pâté de foies gras, the geese are fatted by shutting them up in coops within a room heated to a very high temperature, and stuffing them constantly with food. Here all the conditions for insuring obesity are resorted to—viz., external heat, obscurity, inactivity, and the cramming

* Huber and Gundelach had stated that bees possess the power of forming wax from sugar. Others, however, on trying the experiment of shutting bees up with loaf sugar, could not succeed in getting them to construct their comb; and, therefore, these statements were discredited. The bees when thus restricted to the use of pure sugar only, either would not build at all, or else made so little wax that the quantity might be easily accounted for by that which they naturally retain in their bodies. But MM. Dumas and Edwards (Annales de Chimie et de Phys., vol. xiv. p. 400), conjecturing that possibly these failures might arise from the unnatural position in which the bees were placed, put the matter to the test in a different way. They first ascertained how much wax on the average, is contained in the body of a bee, and then how much wax in honey. Then the swarm was shut up in a closed hive, and supplied, not with sugar as the others had been, but with their natural food. The animals continued to be industrious; but instead of constructing only so much comb as might be derived from the wax of their bodies added to the wax of the honey, that which they formed was three-times as great as could be thus explained. There could be no other source of this additional creation than the sugar of the honey, and from that we must conclude that it arose.

of the animals with nourishment. A still greater refinement for pandering to the appetite is resorted to by the Italians, who appear particularly to relish the fat of the ortolan. To procure this in perfection, the natural habits of the bird were watched; and it having been found that food is only taken at the rising of the sun, cunning men have arranged that this luminary shall rise much more frequently than nature has ordained. To effect this, the ortolans are placed in a dark warm chamber which has but one aperture in the wall. Food being scattered over the floor, a lantern is placed at a certain hour in the opening, and the birds, misled by the dim light, believing that the sun is about to shed its rays upon them, at once consume their rations. The meal finished, the lantern withdrawn, and more nutriment scattered about, the ortolans fall asleep as in duty bound; though probably not without a feeling of surprise at the shortness of their day. Two or three hours having elapsed, and digestion being completed, the lantern is again made to throw its light into the apartment. The rising sun recals the birds to the necessity of again feeding, and of again sleeping as they become enveloped in darkness. Thus this process is repeated several times in the twenty-four hours, until, at the end of two or three days, the ortolan becomes a delicious little ball of fat, ready to minister to the palate of the gourmand.*

* Whiteside's "Italy."

The instinctive desire shown by all nations for an oily diet, and the association of this substance with the ideas of luxury in all times, shows the value of a certain amount of it to a man's comfort. The "butter and honey" of the prophet, used as a phrase for royal food, and the reference in almost every other page of the Bible to oil as a luxury (though it could have been no *rarity* in a land peculiarly described as a "land of oil olive")—these are sufficient to show its estimation among the Hebrews. The Hindoo Sepoy, when he devours his gallon of rice for a meal, will spend all the pice he can get on the clarified butter of the country; and "as good as ghee" is his expression of unqualified praise. It was an error in Dr. Liebig to state that oily foods are an object of disgust to natives of hot climates; all races of men require them and seek after them, and the taste of the Esquimaux, so often quoted, probably depends principally on the abundant supply of the article which the sea places at his disposal, coupled with a scantiness of other provision. Throughout mankind there is an instinctive desire for this food, which, as we have seen, nature finds the most ready material for forming the adipose tissue of the animal body.

A moderate amount of fat is a sign of good health, and physiologists generally allow that the adipose tissue ought to form about the twentieth part of the weight of a man, and the sixteenth of a woman. Independently of the importance of fat as a non-

conducting substance, in impeding the too rapid escape of animal heat, it may also be regarded as a store of material to compensate for waste of tissue, under sickness or other circumstances entailing temporary abstinence from food. Nevertheless, in excess this substance not only becomes burdensome and unsightly, but a real and serious evil. It is hardly necessary to give any description of obesity, since it is a condition recognizable at first sight. Yet it must be remembered that a man may be large, having the muscular system well developed, and the fat proportionately increased, without being obese. "This corpulency or obesity," says Cullen, "is in very different degrees in different persons, and is often considerable without being considered as a disease. There is, however, a certain degree of it, which will be generally allowed to be a disease; as, for example, when it renders persons, from a difficult respiration, uneasy in themselves, and, from the inability of exercise, unfit for discharging the duties of life to others." The *accumulation* of fat must not be confounded with the *degeneration* of muscle and other tissues into this substance.

The *causes* of obesity are numerous. It is often hereditary or constitutional, the inclination being derived from either parent. This tendency is seen not only in individuals, but in nations—*e.g.*, the Dutch are as stout as the Americans are proverbially thin. Over-feeding will induce fat, and so will the

habit of taking too much fluid. The obese are not always great eaters; but they invariably drink a great deal, even though it be only water. Farinaceous and vegetable foods are fattening, and saccharine matters are especially so. The instance of slaves in Italy, who got fat during the grape and fig season, has been quoted by Galen. In sugar-growing countries the negroes and cattle employed on the plantations grow remarkably stout while the cane is being gathered and the sugar extracted. During this harvest the saccharine juices are freely consumed; but when the season is over the superabundant adipose tissue is gradually lost.*

The necessity of abstaining from the saccharine materials, and all those allied to them, which in the metamorphosis of digestion form sugar, will be obvious from what has been stated. The following scale of diet may as a rule be adopted:—

Breakfast.—Four to six ounces of meat, two ounces of biscuit or toast, and a large cup of tea, but without milk or sugar. *Dinner.*—Ten to twelve ounces of any fish, except salmon—any vegetable, except potatoes and vegetable roots—any kind of poultry or venison, and two ounces of toasted bread. With it drink two or three glasses of good red wine, sherry, or madeira, avoiding champagne, port, and beer.

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* Tanner's "Practice of Medicine," published by H. Renshaw, 356, Strand.

In the afternoon four to six ounces of fruit, one or two biscuits, and again a large cup of tea without milk or sugar. *Supper.*—Six to eight ounces of meat or fish, and one or two glasses of red wine. In order to ensure a good night's rest, often, before going to bed, drink a glass of grog without sugar, or else one or two glasses of sherry or red wine. If the bread or biscuit is too dry, moisten it with a spoonful of brandy.

Such was the diet advisedly adopted in Mr. Banting's case, which of course must be modified as circumstances require in others.

As to what is unnecessary, that of course is different in different cases. In the diet I usually forbid or place great restrictions on all saccharine and fatty matters, pastry, &c. 1. Because I know that most people eat too much of them; 2. Because they are the chief elements of what is called respiratory food, and thereby load the pulmonary machinery; 3. Because there is quite sufficient of these in lean meat as ordinarily eaten, in edible vegetables before indicated, and in other substances; and better calculated for attaining the object in view. Lastly, because any excess of these matters tends to *load the liver*, which it is in all cases most desirable to keep freely in action.

The least acute and rapid hepatic diseases are traceable and amenable to dietetic influences, and are best treated according to this view. Whether we administer mercurials or other known specifics, supposed to exert a specific influence on the liver, their beneficial

effect is proportioned to the extent to which they determine the nutritive changes occurring in the organ, and the reciprocal relation between the general nutrition of the body and the local nutrition of the organ in question. The difficulty under which we labour, is to determine the exact condition of malnutrition which at any time prevails, and the exact irregularity in the metamorphoses induced in and reflected from the liver. We require a much more accurate diagnosis of the changes (even of a coarse kind) which take place in this important organ, than we now possess; but, so far as our knowledge goes, the pathology and therapeutics of hepatic disease, equally, seem to confirm the view that primary or secondary malnutrition forms the basis upon which all disorders of the liver rest.

If we fail to discover any specific treatment for hepatic disease, we are not more successful in a similar search in the range of the urinary organs. We have seen that there is good reason for regarding all renal disease as depending upon antecedent morbid conditions of the blood, brought about by errors of diet and regimen, demanding, at an early stage, such measures as may enable the affected organ to recover its normal balance by throwing off the poison and its immediate effects. But, practically, we are much more frequently called upon to enable the organism to adapt itself to a permanent disturbance of balance, because we are unable to effect a cure. In the former case, we endeavour either to relieve congestion and

inflammation by drawing blood to other organs and establishing vicarious secretions, or we are able, by increasing the secretions of the kidneys themselves, to remove the offending cause. (*Vide* p. 97.)

An exact knowledge, however, of the structural effects of diet, including the albuminous, fatty, and mineral constituents of food, whether animal or vegetable, and of the various kinds of drinks, is yet to be arrived at with certainty. Much attention has been in recent times devoted to this topic, and, doubtless, will add much benefit in the cure of disease generally, and also specially.

It is not mere nitrogenous or non-nitrogenous kinds of food that will serve for nutrition, theoretically supposed by the chemist. To form tissue they must be converted into albumen and oil, so as to form the constituent part of the blood.

For instance, the amount of oxygen in the atmosphere greatly influences the quantity of food. If cold and condensed, more oxygen will unite with the tissues and more nourishment will be required to meet the demand; if warm and rarefied the appetite diminishes, and less nutritious food is required; thus it is of the last importance to take these points into consideration before undertaking the treatment of a case of corpulence.

All living beings are governed in the selection of food by laws which the chemist cannot regulate. Hence chemistry may teach us much; but the laws of dietetics,

after all, must be regulated by the study of physiology. It is unnecessary to dwell at any length upon the fact that, of all causes of disease irregularity of diet is the most common, and the sequence is, that of all means of cure at our disposal attention to the quantity and quality of food is by far the most powerful. The peculiar kind of aliment which this disease requires has been alluded to.

These and similar facts clearly show the paramount importance of diet, not only in preserving health, but, when correctly used, in curing disease. Highly important in the treatment, in a therapeutical point of view, in a disease of this chronic character, is the medical advice, of course, regulating the quantity as circumstances occur.

What we require to learn is the influence of the various substances which unite with our food, or form the tissues of our bodies, as well as the chemical and structural metamorphoses these undergo during the acts of assimilation, secretion, and excretion.

The question, however, of fat accumulating in particular parts of the body so as to produce disease is quite a different one to that of corpulence. Many corpulent persons enjoy excellent health, and I strongly recommend them to let well alone. It is, however, desirable when persons are suffering in health, to know as near as possible what their normal weight should be. We are indebted to the late Dr. John Hutchinson for weighing above two thousand

six hundred men at various ages. I was struck with an obvious relation between the height and the weight of the persons he so pertinaciously weighed and measured, starting with the lowest men in his tables, it would be found that the increase of weight was as nearly as possible five pounds for every inch in height beyond sixty-one inches. The following figures show the relative height and weight of individuals measuring five feet and upwards :—

STATURE.				WEIGHT.						
5	feet	1	should be	8	stone	8	or	120	lbs.
5	„	2	„	9	„	0	„	126	„
5	„	3	„	9	„	7	„	133	„
5	„	4	„	9	„	10	„	136	„
5	„	5	„	10	„	2	„	142	„
5	„	6	„	10	„	5	„	145	„
5	„	7	„	10	„	8	„	148	„
5	„	8	„	11	„	1	„	155	„
5	„	9	„	11	„	8	„	162	„
5	„	10	„	12	„	1	„	169	„
5	„	11	„	12	„	6	„	174	„
6	„	0	„	12	„	10	„	178	„

The proportion which this tissue ought to bear in weight is of great practical importance. That there is for every adult man of a certain height a tolerably definite weight, which is not difficult for any individual to find out, and that all considerable permanent additions must consist of fat. As to the exact amount of fat which may exist without proving injurious to health, there appears to be the greatest variation, some possessing an enormous development of this tissue and enjoying perfect health.

These figures of height and weight, taken from Dr. Hutchinson's paper on that subject, should be read with some degree of caution. But we must be mindful of the observations of that gentleman when he points out that it is very difficult, from our scanty knowledge upon human statistics, to say what is a person's proper weight, and no doubt it is so, to satisfy the requirements of a physiologist or statistician. But still there is a degree of knowledge, very far from perfect and accurate, on which we are in the habit of acting in the daily concerns of life, and which as long as we continue to bear its deficiencies in mind, and are ready to correct them when the opportunity offers, is really as valuable to us as mathematical certainty. "It is impossible," as Dr. Hutchinson remarks, "to say where the weight by excess commences: it is therefore only in the extremes of weight that we can positively say that there is excess or deficiency." But it is with these extremes that we are now concerned, for it is in extremes only that disease consists, and with the slight variations from what, as physiologists, we lay down as the normal condition, our interference is not required.

If, for example, a proposal to insure a life be sent from the country, backed merely with the opinion of a referee whom we do not know, that "no signs of disease are discoverable," and that "the proposer has a robust appearance," our knowledge of the tendencies

of his constitution is small indeed. But if to this it be added that he is five feet eight inches high, and weighs eleven stone, we feel a certain degree of safety in accepting him. But should his weight be seventeen stone, a probable deposit of fat in the omentum and the heart occurs to us,—disturbance of the abdominal circulation, apoplexy, &c., are suggested, and the liability balanced and inquired about. A corresponding deviation from the natural weight, in the other direction, would in a similar manner lead to a more detailed examination of the chest, and a calculation of the possible existence of tubercle. When we remember that four-fifths of the losses at insurance-offices arise from apoplexy and consumption, the safety which they would gain by the simple observation above mentioned is obviously very important to those engaged in such enterprises. I may add, too, it facilitates much the explanations of the reasons for a refusal or acceptance, which the directors will sometimes require from their medical advisers; for it depends on a reasoning comprehensible to all, and capable of reduction to figures; so that we are thus enabled to follow the advice of the wise man of old, which bids us "deliver all things in number," and can avoid the vagueness of a mere negative opinion.*

Or, to further the illustration, if a man of five feet, whose weight should be eight stone, increases to

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* Chambers "On Corpulence."

twenty-eight, no less than twenty stone of additional fat have to be supplied with capillaries, and those capillaries have to be supplied with blood by vessels constructed to circulate but one *third of the quantity*. How wonderful must be the power of adaptation which can render such a change consistent with life at all! how little cause for surprise if that life is short, and burthened with innumerable ills!

Why so little regard is paid to changes in weight by the profession at large is difficult to understand, unless the observation made by a crafty politician on the faith of the vulgar is also applicable to men of science, and they are more disposed to trust to what is obscure and hard to observe, than to what is easy and obvious. They will rather attempt to prove an uncertain negative by a laborious investigation, rather state doubtfully that a disease is not worse, because their fallible eyes or ears cannot find it to be so, than establish the affirmative of restored health, by observing that there is sufficient energy of system to form healthy fat. Or they will take the word of a cheerful patient that his health is improved, or trust to the variable indications afforded by his secretions alone, without testing them by an instrument so simple that it is in daily use among those who cannot read, but withal so trustworthy that it is taken for a type of the divine attribute of justice.

It is important to bear in mind in the treatment of corpulence, that a human body weighing eleven

stone, or 154 pounds, may be said to contain the following compounds and elements :—

COMPOUNDS.	lb.	oz.	gr.
Water	111	0	0
Gelatin	15	0	0
Fat	12	0	0
Albumen	4	3	0
Fibrine	4	4	0
Phosphate of Lime	5	13	0
Carbonate of Lime	1	0	0
Fluoride of Calcium	0	3	0
Chloride of Sodium	0	3	376
Chloride of Potassium	0	0	10
Sulphate of Soda	0	1	170
Carbonate of Soda	0	1	72
Phosphate of Soda	0	0	400
Sulphate of Potash	0	0	400
Peroxide of Iron	0	0	150
Phosphate of Potash	0	0	100
Phosphate of Magnesia	0	0	75
Silica	0	0	3
	150	0	0

ELEMENTS.	lb.	oz.	gr.
Oxygen	111	0	0
Hydrogen	14	0	0
Carbon	21	0	0
Nitrogen	3	8	0
Phosphorus	1	12	190
Calcium	2	0	0
Sulphur	0	2	219
Fluorine	0	2	0
Chlorine	0	2	47
Sodium	0	2	116
Iron	0	0	100
Potassium	0	0	290
Magnesium	0	0	12
Silicon	0	0	2
	154	0	0

If we consider what are the periods of life at which fatness is usually most developed, we shall probably gain a clearer idea of the impolicy of wholesale exhaustive measures for the reduction of corpulence. Generally, this tendency does not conspicuously gain the upper hand till late in middle life; in fact, till just that period when the powers are beginning to fail. In such persons a careful anatomical search, could it be made, would discover other and very significant traces of the failure of

vital energy, even though these might be such as are consistent with an extended prolongation of life.

The following table shows the daily supply and waste of a human body weighing eleven stones, and measuring five feet eight inches in height. This, of course, will vary as before observed, and requires a little latitude, but on the whole, it may be relied upon :—

TAKEN IN.		OZ.	GIVEN OUT.		OZ. GR.
I.—*Gases.*			I.—*Gases.*		
Oxygen		24	Carbon . . .	11 oz.	
			Oxygen . . .	24	
				—	35
II.—*Liquids.*			II.—*Liquids.*		
Water :—			Water :—		
In beverages	68 oz.		By kidneys .	51 oz.	
In solid food	25	93	By lungs .	31	
	—		By skin . .	16	
III.—*Solids.*			By alimentary canal . .	5·237	
Flesh producers :—				———	103·237
Fibrine . .	3 oz.				
Albumen and caseine .	1	4	III.—*Solids.*		
	—		Insoluble		2
Heat-givers :—			Soluble :—		
Starch . .	12 oz.			oz. gr.	
Fat or butter	5		Urea . . .	1·200	
Sugar . .	2	19	Salts . . .	1	
	—			———	2·200
Indigestible :—					
Gelatine . .	1 oz.				
Cellular . .	1	2			
	—				
Mineral matter . . .		1			
		143			143·000

These figures show approximately the nature and extent of the various chemical changes taking place

within a human body, in a normal state of health, in a cycle of twenty-four hours. When important alterations occur in the nature and quality of these processes, disease ensues, and hence the necessity of submitting to medical treatment for the cure of corpulence at an early date. It is the excess of adipose material the physician has to regulate, and a consequent debility in the system, and more particularly in the circulation of the blood.

Excess in this respect is equally injurious with deficiency. Indeed, practically speaking it is more injurious, because the dangers to which it exposes the individual are more likely to be induced by the ordinary course of our lives than are dangers which deficiency is subject to. By an over-development of adipose tissue the capillary system of blood-vessels is vastly increased in aggregate bulk, while at the same time no corresponding increase takes place in the forces which supply the means of action to those capillaries. Hence there is a comparative weakness in the conservative vital actions, and an injury to any part of the body, especially to those parts which, physiologically speaking, are most distant from the fountain of life, and is less easily repaired.

No claim can be made for the accuracy of the above table beyond a rude approximation to the truth; but as no one has yet analysed a whole human body, we may take these calculations as representing the composition of these elements.

These substances, however, are not in a quiescent state. They are all of them constantly undergoing chemical change, and the result of this chemical activity is what is called life. One of the necessary conditions of the life of the body is that it be placed in an atmosphere containing oxygen gas. Our atmosphere contains 79 parts of nitrogen and 21 parts of oxygen in every 100. This oxygen is being constantly taken into the human body. If we prevent the oxygen getting into the lungs by hanging, drowning, or any other process, the person is suffocated. It is the oxygen which consumes the body. Just as a burning candle is consumed in the air, so is the human body. The oxygen attacks the carbon in the system and forms carbonic acid; it unites with the hydrogen and forms water. It has been calculated that twenty-four ounces of oxygen are every day taken into a human body weighing 154 pounds. This oxygen does not remain in the human body, but comes away from it again in the form of carbonic acid gas, which is expelled from the lungs. Twenty-four ounces of oxygen will unite with eleven ounces of carbon, and thus form carbonic acid, which is disposed of in respiration.

There exists, moreover, a *vital* action which no natural philosophy can elucidate. The lights of chemistry, feeble as they are in the stomach and first intestine, fail us altogether after the change produced by the admixture of bile. At this period of the pro-

cess it is probable that certain organic changes result, and are developed and modified by a new class of actions, wholly different from what we understand by *chemical* transmutation; in short, the organization and the composition of the *products* are to be regarded, and which during their passage through the liver are doubtless elaborated by a series of ascending changes into forms of increasing complication.

The only safe conclusion at which we can arrive upon this subject may be embodied in the following— 1. *That animal food in its various forms proves more stimulant in these cases to the lungs than vegetable element.* 2. *That fermented liquors are injurious to these organs, both on account of their general effects upon the circulation, and their specific action upon the nervous system: increasing on the one hand the necessity of respiratory changes; and on the other, diminishing the energies of the organs by which they are accomplished.* 3. *That moderate exercise, hilarity of mind, free ventilation, and abstinence from fermented liquors, are essentially necessary in this disordered condition of the body, in order to promote the free evolution of carbonic acid from the pulmonary organs.*

As regards the quantity of food, this must be regulated by the feelings of the patient, and he will not have occasion for any artificial standard of weight and measure. But he must, in such a case, restrict himself. An indulgence in variety provokes an artificial appetite, which he may not readily distinguish

from that natural feeling which is the only true indication.

But the quantity of food required by the body is also exposed to circumstances which are just as certain to baffle all such calculations. For this quantity will evidently vary with the rate of waste sustained by each individual, and also with the activity of his life, the nature of his habitual exertion, and the state of his mind, as well as with the climate, race, temperament, and education, which help to form the microcosm of every man's personality. The degree of variation which may be brought into play by each of these circumstances it is impossible to specify, though it would often receive no inapt illustration from a comparison of the habits of the various members of a family or other social circumstances.

Hence the true value of physiological chemistry, in respect to the principles of dietetics, is that of being a correct guide to the general composition of a daily food. In this capacity, it is not too much to say that its veto ought to be absolute; but with this negative function terminates its practical usefulness. Our choice of the exact quantities and qualities of alimentary substances necessary to construct a perfect scale of diet, may indeed be sometimes explained by chemistry; *but it must always be dictated by experience.*

But the rate of waste, and the consequent need of replacement, both depend far less on physical causes

of this kind than on certain actions which are specific to the organized body. These actions, which in the aggregate make up what we term life, do not so much imply as actually consist in a perpetual process of flux and metamorphosis. This multiform change engages the whole of the corporeal tissues, and conducts their various ingredients through a number of successive phases of composition to an effete and useless state, in which they are finally ejected from the body.

In examining the phenomena of waste and supply, we shall observe that there is a marked difference, depending on age, health, temperament, and bodily exercise, in the proportion of the parts which enter into this current, and of those which abandon it; and that the velocity of the motions usually varies according to the different conditions of each living being. A knowledge of these differences, which is to be discovered only by ample experience and well-directed observation, must constitute the basis of a true theory for the regulation of diet. If it be said that a deficient quantity of food is indicated by our feelings, and that an excess is carried off without inconvenience, I shall reply that, under ordinary circumstances, *nature rarely suffers from abstinence, but continually from repletion;* that while in one case she limits her expenditure to meet the exigences of her income, in the other she is called upon to exercise an injurious liberality to throw off by various secretions and exhalations the

useless burden. In the vigour of health and youth the evils of such a system may not be felt; but as life advances organic changes are slowly and imperceptibly produced, which ultimately, by their aggregate effect, clog the machine, and lead to disease and premature death.

It will be understood, then, that we are continually undergoing change; the body is thus hourly, nay, constantly being built up and taken down. It is thus that the house in which we live is perpetually passing away, the physical and chemical forces acting on particles of matter too minute for even microscopic vision. This chemical activity may be considered as life.

> "And men themselves do change continually
> From youth to eld, from wealth to poverty,
> From good to bad, from bad to worst of all;
> In doe their bodies only flit and fly,
> But eke their minds (which they immortal call)
> Still change and vary thoughts as new occasions fall."

Evermore our bodily frames are wearing out, and being thoroughly renewed till weary eld. Some portions of tissue, of *brain substance*, of muscle, of *nerves*, of skin, of the whole body, are perishing continually and the dead portions are removed in various ways from the body, while their places are taken by new tissue. This new tissue is formed from the food we take.*

* Lowndes, on "Health."

It is obvious then when once the body has reached its full development in manhood, the quantity and quality of the food should be regulated by the demand made by the wear and tear of the body. If, for instance a person, already sufficiently stout, is growing fatter and fatter, he is taking more fattening food than is necessary or safe, and must restrict himself. In like manner, if a person free from disease is getting too thin, he must endeavour to make such a change in his diet or mode of living as may stop his growing thin, as it is evident the supply of fattening food taken is not sufficient to meet the demands made by the wear and tear of the body.

As a summary, I think we may assume that, except in the sense of mere make-weight or momentum, the undue accumulation of adipose material is a source of weakness, not power; and *without due attention to arrangement, and the laws of proportion*, we know that the addition of a large increase does not add to beauty or stability, but the contrary. The moment the quantity of material exceeds the laws or principles of the structure, instead of adding to strength and usefulness, it becomes a source of imperfect equilibrium, increases the liability to disease, or is only a deformity at best. In organized bodies, whenever the corporeal development exceeds the amount of vital action it becomes an oppression and incumbrance, and eventually is productive of great disorder in the general system. For example,

the largest buildings and the most bulky animals are certainly not the most useful; nor in proportion the strongest. Matter that is not in full requirement, is usually an annoyance, and a source of discomfort; the smallest means that are sufficient to produce any given result are the most important in nature; and, as a general rule, the more space anything occupies in the world, the more it is exposed to outward enemies, and the more numerous are its internal sources of destruction and decay.

APPENDIX.

I HERE subjoin a portion of a lecture delivered by Dr. Niemeyer, on the subject of this Essay, feeling confident, from the Professor's well-known accuracy and his desire at all times to further the ends of medical science, that it will be found highly interesting to the general reader, being at the same time practical and useful. It has also the advantage of demonstrating in a brief space the outline of the system to be adopted, and the mode in which it should be practised.

I will now endeavour to explain to you, says Dr. Niemeyer, the contents of Mr. Banting's pamphlet from a scientific point of view, and to indicate how far the facts which he communicates are in harmony with, and how far they deviate from the present opinions of physiologists and medical men.

In order to solve this problem, it is especially essential to examine more minutely the system of cure to which Mr. Banting owes his recovery, and to answer the question, whether the various principles advocated can be viewed as a whole, and recognised as one system.

It can, indeed, be easily proved that in drawing up the bill of fare for our patient, and also indicating precisely what should be avoided, we must act upon certain consistent principles. If we compare those aliments of which Mr. Banting was allowed an unlimited use, with those of which he was only allowed to take a small quantity, we shall see that by such a

diet, the body would receive essential nourishment from the former in very plentiful, but from the latter in very limited proportions.

Those aliments of which a plentiful use was permitted to Mr. Banting, are classed by Baron Liebig among the "plastic" means of nourishment, whilst those of which he was only to partake sparingly, are called the "means of respiration." There is, however, much to object to in this nomenclature.

As before mentioned, these two alimentary elements are indispensable for the continuance of life, and in order to prove this assertion, I will shortly allude to the organic requirements of the body, and to the manner in which these means of nourishment operate. The organs and tissues of which the body consists, are constantly becoming worn out and used up; and in order therefore, to prevent the dissolution of the body, it is absolutely necessary that the loss which thus arises, should be constantly replaced by new material. Equally indispensable for the continuance of life is the maintenance of the body at a certain temperature. The fluctuations of temperature to which the skin is exposed, do not affect the interior of the body. Man can live and prosper at the poles, or under the equator, and notwithstanding the icy cold of the one, or the glowing heat of the other, the normal temperature of his body may be always maintained.

In order to meet the first necessity, viz., to replace the loss of the worn-out tissues, it is necessary to assimilate the substances of which those tissues consist, or of which they may be formed. Now, the most important organic tissues of the body consist principally of the so-called albuminous bodies, *i.e.*, of the white of egg itself; of the muscular fibre, &c. It is, therefore, necessary that the body should be constantly supplied with albumen; and neither man nor animal can exist if albumen be entirely withheld from them for any length of time.

The second condition necessary for the support of life, viz., the maintenance of the normal temperature of the body, is attained by our body undergoing a continual process of combustion. Although no flames such as accompany the burning of wood in the open air, arise from this combustion, yet heat is still developed, and thus the body is continually supplied with warmth.

The oxygen of the air, which we breathe, and the connexion of which with the component parts of the body in developing heat, we just now called combustion, has much less relation to the above-mentioned albuminous bodies, than to certain other parts of the organic system, which are therefore consumed quicker, and in larger quantities. The constant waste (principally in producing warmth) of these component parts of the body must be replaced by new material, and this is accomplished chiefly by additions of fat, starch, vegetable gum, sugar, and other similar substances. [The hydro-carbons which go by the name of fat, differ from other hydro-carbons, as sugar and starch, in the circumstance that the oxygen is never in sufficient quantity to satisfy the affinity of the hydrogen, and therefore fat is more energetic as a respiratory or heat-producing agent. Its power, indeed, in this respect, is just twice and a half as great as that of dry starch or sugar; for ten grains of it in a dry state will, by combining with oxygen, develope sufficient heat to raise 23·32 lbs. of water 1° F.; and according to the deductions of both Joule and Meyer, this is equivalent to the power of raising 18,003 lbs. one foot high. In cold countries, where animal warmth is required, food rich in fat is always preferred; and the fat bacon of the English labourer contributes in no small degree to the production of mechanical force. But besides this, fat serves important functions in the processes of digestion, assimilation, and nutrition. According to Lehmann, it is one of the most active agents in the metamorphosis of animal matter; and this is seen not merely in the solution of nitrogenous articles of food during digestion,

but also in the conversion of nutrient plastic substances into cells and masses of fibre. Elsässer long since observed that, during the process of artificial digestion the solution of nitrogenous foods was considerably accelerated by means of fat; and Lehmann has since determined, by actual experiment on dogs, that albuminous substances deprived of fat remain longer in the stomach, and require more time for their metamorphosis than the same substances impregnated with fat. It is probable indeed, that the digestive power of the pancreatic fluid is due in great measure to the presence of fat; and that the subsequent chymification of food, and its absorption into the blood, is greatly assisted by it. There is also good reason for believing that it is largely concerned in the formation of bile, and that the biliary acids are conjugated fatty compounds. This and other such foods assist in promoting the secretion of bile.—LETHEBY *on Food.*] If the aliments absorbed have not for some time contained any such substances, the body suffers precisely the same process of dissolution as if no albuminous matter had been taken in nourishment.

There have been many direct experiments made on animals, which have been fed exclusively on the one or the other of these last-mentioned simple aliments, in order to ascertain whether they could be kept alive for any length of time.

All these experiments have had negative results, and every one of the animals succumbed after a shorter or longer period.

From these experiments it is evident that none of the ordinary alimentary substances contain exclusively either the one or the other of the elementary materials of nourishment. Nay more: however much the various alimentary substances which are absorbed by man and all classes of animals may differ in their composition, yet they all contain substances belonging to the class of "plastic" matter, as well as to the class of "the means of respiration." For instance, in eating meat,

besides the albumen and the material forming the fibres of the muscles, we absorb a certain quantity of fat—a representative of the second class of substances.

In like manner, we consume the starch and the albumen contained in bread and potatoes.

Although all ordinary alimentary substances contain elements from these two principal classes, there is still a great difference in the proportions of the "plastic" nutriment, and the "means of respiration." Generally speaking, the "plastic" nutriment predominates in the aliments derived from the animal world, whilst in those of vegetable growth, the "means of respiration," such as starch, sugar, &c., prevail.

You are now in a position to judge for yourselves whether the above theory is logical and follows a definite principle in drawing up our patient's bill of fare.

You will perceive that whilst we allow our patient to eat great quantities of meat, he should be forbidden fat, potatoes, sugar, and milk; that the allowance of bread should be reduced to a very small quantity, that the supply of "plastic" nutriment be lessened, and also the means of the supply of the "means of respiration."

According to the theory held by some distinguished savants, especially Liebig and Moleschott, respecting the absorption of alcohol by the human body, the only error with which Mr. Harvey can be taxed, is that he allowed his patient a comparatively large supply of spirituous liquors. Liebig and Moleschott classify alcohol under "the means of respiration;" for it is burned up in the body and serves for the purpose of obtaining warmth. But he must be absolved even from this apparent error. The theory that alcohol undergoes a process of combustion in the body, is not founded upon direct experiment, but belongs to the region of hypothesis. I am further supported in making this assertion by the fact that the experiments of my friend and colleague, Mr. Hoppe-Seyler, and of

Messrs. Setchenow, Buchheim, and others, have proved that alcohol is not burned up in the human body, but is thrown out (at any rate the greatest part of it) in an undecomposed state. My own convictions also confirm the soundness of the opinions held by Messrs. Hoppe-Seyler, Setchenow, and Buchheim, for in thoroughly intoxicated individuals the temperature of the body is by no means abnormally high, but abnormally low, notwithstanding the full veins and reddened head.

I must, therefore, repeat that I consider the permission to drink wine, and even brandy, perfectly logical.

It was also perfectly correct and logical for Mr. Harvey, whilst allowing the use of wine, to forbid the use of beer, especially the highly malted English beer. From the stronger descriptions of beer, the body absorbs not only alcohol, but likewise considerable "means of respiration."

[With regard to the use of *fermented liquors*, there is the same universal indication of their serving a profound physiological purpose, and supplying a common want. It is no argument that, because these things have been abused they serve no purpose in man's economy. On the contrary, the fact of their use in all time, and that no saccharine liquid, or juice of ripe fruit, can be exposed to the air without spontaneous and almost immediate *fermentation*, are striking evidences of design and a useful purpose. They may not enter into the composition of tissues, but they may stimulate the energies of the living frame, and rouse them into increased activity. It is not merely the brickwork and marble, so to speak, of the human body, nor yet the rough movements of the machine, that have to be sustained, for there are rarer forms of matter, and higher manifestations of force, concerned in man's existence; and his resort to such beverages as these may be for something more than the nourishment of the system or even the mere raising of his spirit above the com-

mon concerns of this work-o'-day world. That *alcohol* stimulates the action of the nervous system there is no doubt, and it is equally certain that it increases the respiratory changes. It appears then in the breath and perspiration, as well as *in the urine*. They, therefore, conclude that alcohol is not a food, but it is a mere excitor of nervous centres. On the other hand Dr. Thudichum, in a rather large experiment on the students of his class (33 in number), found that of the 61,730 grains of alcohol in the 44 bottles of wine which they drank at one sitting, only 154·3 grains appeared in the urine; assuming that the same quantity was exhaled by the breath and skin, he concluded that only 0·5 per cent. of the alcohol escaped unchanged. He therefore believes that alcohol is *oxidized* in the body, and is a true food.*]

However, the fact that Mr. Harvey did not follow Liebig's theory, but forbade beer, and allowed wine, has doubtless been productive of important practical consequences. Had he like-

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* Alcohol addresses the nervous system. It first excites and then depresses and overcomes. It has been the great tempter and curse of man since the days of Noah. It has been hailed by poets and praised by prophets, and, again, driven from society as a devouring beast. It may, perhaps, be safely advanced that, with his present tendency to abuse this substance, man would be better without it. Nevertheless, if guided by reason, it may be made by man an alleviation of his sorrows, a protection to his health, and a harmless contribution to the pleasures of his social meals. The great question is, how much may be taken from day to day with impunity. Without going into any question of its action on the system, whether it is partly burned or all got rid of by the secretions, I would say that my experience is that a healthy man, taking open-air exercise every day, cannot safely consume more than two ounces of alcohol daily. Roughly, this quantity is represented by a pint of strong ale, or a quart of London porter, or four glasses (or eight ounces) of port or sherry, or eight glasses (or sixteen ounces) of hock or claret. More than this may be excess; but every man should be the judge of his own requirements. When alcohol affects the head, or produces thirst, or deranges the stomach, or liver, or kidneys, *it should be given up or reduced*. There is no doubt, however, on my mind, that men, women, and children can maintain their health through long periods without having recourse to alcohol at all.—*Lankester*.

wise forbidden the use of wine, it is possible and indeed not improbable, that the energetic Mr. Banting would have conscientiously followed this prescription, but I much doubt whether the Banting system would then have gained so many adherents. The sacrifice of drinking wine instead of beer is much easier than the sacrifice of abstaining from all spirituous liquors.

Having now analysed the diet which Mr. Banting followed, and reduced it to a definite principle, let us compare these results with those at which physiologists and the investigators of physiological chemistry have arrived in their researches concerning the changes in the elements of nourishment and the influence of aliments in the production of fat. This question has been examined with particular attention, and in this field science has achieved great triumphs. It would occupy too much time if I were to describe the details of all these researches; I will, therefore, only bring before you a few simple facts.

It is well known that the bodies of carnivorous animals, in whose nourishment "plastic" aliments predominate, contain very little fat, whilst the bodies of ruminating animals, in whose food the "means of respiration" prevail, are much fatter, and can easily be fattened by plentifully administering to them the "means of respiration." I have only to point to animals of the cat and dog species: in their wild state they live only on flesh and yet remain thin and lean, in spite of the rich nature of their nourishment: but they gradually become fat when tamed and accustomed to a mixed diet, such as potatoes, bread, &c.

I can also mention the prevalence of corpulence in certain castes, who live exclusively on milk, rice, and fat: their religion forbidding them to eat meat or eggs; and these may be contrasted with the muscular, but thin, bodies of those tribes whose only means of subsistence is derived from

hunting and fishing. These few examples may suffice. From similar facts, ascertained after careful and exact experiment, physiologists have arrived at the conviction, that the production of fat bears a certain ratio to the amount of "the means of respiration," and scientific men have no hesitation whatever in designating "the means of respiration" to be the depositor of fat.

We may see the proof of this, in the fact that Mr. Banting became fatter as long as he lived what is called "low," *i.e.*, when he ate principally bread and potatoes, with the addition of large quantities of beer, milk, and sugar; whilst, when he lived "well," *i.e.*, principally on meat, he became thinner.

This fact corresponds exactly with the laws for the production of fat which the observations and experiments of physiologists have established.

I will however remark that, notwithstanding the satisfactory progress of science, and the accurately ascertained proportions of the "plastic" aliments and "means of respiration" required to produce a great amount of fat, the precise process of producing fat from these substances is by no means defined.

Most scientific men (and Liebig among others), who have examined the subject, have no doubt whatever that the fat producers are transformed into fat, and that this fat passes into the tissues; but there is another theory, advocated likewise by many distinguished men, which deserves attention. According to this theory the fat itself, as well as the fat producers, which we absorb with our aliments, are *consumed in the blood*, and used as the means for producing heat, and likewise the fat which is formed in the body, is produced from the fleshy or albuminous substances in the system. Numerous examples may be adduced in favour of this last explanation of the production of fat.

[There still remains for our consideration a phenomenon, intimately connected with the digestive process and with the *derangements* to which it is liable,—the formation of *fat*. This

substance may be regarded as the least animalized product of the animal body, since it does not contain any nitrogen, an element which, it will be remembered, is peculiarly characteristic of animalization; nor does it contain any considerable portion of oxygen, but consists principally of hydrogen and carbon, the latter element being far less in its proportion than that which occurs in any of the constituents of the blood, from which fat is secreted. It is true that we have no certain data for enabling us to judge from what part of the blood the *fat* is immediately produced, nor does there appear to be any specific organ for its secretion; but, as its deposition is evidently connected with the state of the digestive functions, and bears a relation to the quantity of the respiratory food produced, and as fat is deposited in so many parts of the body, or at least, is connected with textures of such various descriptions, it is fair to conclude that the blood must be the source from which it proceeds, and the medium through which it is distributed, and moreover, that the capillary vessels must constitute the organ for its secretion. Dr. Bostock observes that there are two modes in which we may suppose the fat to be produced—while in the vessels themselves, or not until it is just upon the point of being *excreted* from them. In the first case the operation must consist in the abstraction from the albumen or fibrin of its nitrogen and oxygen, and a part of its carbon; in the other, of the hydrogen and a part of the carbon, while the remainder of the elements are left in the vessels.]

There is no doubt whatever, that in the organism of the body, especially in cases of disease, albuminous substances are frequently transformed into fat.

The fact already mentioned, that only those animals can be fattened, which, in addition to a plentiful supply of starch, vegetable gum, &c., eat a certain proportion of albuminous substances, is much more easily explained by this theory, than by the theory of Liebig.

[Mulder's discoveries in 1838 led up to the doctrine that the albuminous compounds of plants and animals agree in composition and properties; whence it was inferred that the animal simply took the compound of the plant, and made it a component part of its own body. Liebig, however, was the first to maintain that animals possessed the power of forming one kind of organic compound out of another. Upon this there arose a controversy, with particular reference to fat. In opposition to Liebig's teaching, that in the animal system fat was producible from sugar, Dumas and Boussingault held that whatever fat was found in an animal being came through its food from without. It is now, however, matter of history that the French authorities have had to abandon their doctrine in favour of the German. Broadly, however, we may say that the chemical functions of the plant are those of reduction or deoxidation, whereby carbonic acid and water are deprived of their oxygen and moulded with nitrogen into food; while those of animals are of an opposite nature, for they destroy this food by oxidation. The plant, therefore, is the machine or medium whereby carbonic acid, water, and ammonia, are converted into new compounds, and light and heat are transmuted into chemical affinity; and the animal is the medium or machine whereby these compounds are destroyed, and their affinities changed into other manifestations of force, and finally into heat. In this way the circuit of change is completed; and it is not difficult to trace the phenomena of vitality to the cosmical forces which the plant had imprisoned. The illustrious chemist and distinguished orator, M. J. Dumas, has thus expressed himself on this subject:—"The first studies we pursue on the chemical phenomena of life, teach us that plants create, and animals destroy, organic matter. The sun appears as the agent by whose means this matter is produced, and combustion by the air that animals breathe, as the process that destroys them, in order to restore their elements to

the state of 'brute' matter. The chemical forces placed at the disposal of life descending on the earth under the form of light, disappear by radiating off into space under the form of heat. An equilibrium obtains between the vegetable and animal kingdoms for receipts and disbursements, represented by these two forms of motion—light and heat, and the amount of animal life which may be developed on the globe is measured by the amount of food that vegetable life has prepared for it. The dark rays of heat appear to carry off from the earth that which the radiant and brilliant light has spread over it."—*The Faraday Lecture, Chemical News*, vol. xx. p. 4.

But the most beautiful instance of this transformation occurs in nature. While the fruit of the olive tree is forming, the sap of the stem is sweet and full of starch; it continues so till the product, which makes the trees valuable, begins to swell the berries: then in exact proportion as the oil is elaborated, the saccharine matter decreases in that which supplies the nutriment to it. When the harvest is ready, not a trace of sweetness remains. These instances are evidence of the possibility of changes occurring of a less simple nature than had been suggested, and of the capability of other elements of food for conversion into fat.]

I will finally draw your attention to the well-known fact that the nourishment of the muscles suffers considerably from an immoderate development of fat; corpulent men are therefore generally not only not powerful, but often feeble. And the diseases most feared by these persons, such as enlargement of the heart and dropsy, arise principally from the muscular tissue of the heart being deprived of its normal nourishment, and being also partially expended in the production of fat.

[Fat is no part of an animal; an animal is the same without it as with it. In all cases of conversion of tissue, it never appears but as a loss, and is literally no part of, or essential part, of an animal. And although Mr. Hunter in his days

could not establish but on theoretical grounds the fact of this degeneration, we may, by adapting ourselves to the advancement of science, use language even stronger than he did of that inferior material, fat, which commonly advances as life is weakened, and is one of the best possible evidences of decline, and proof of debility. We may remark in cases of fatty degeneration or decay, that the substance which replaces the highly-organized animal matter, is not utterly inorganic. It is less organized, and less organizable, but still capable of being called alive. Of our living bodies, fat is a part and a necessary part; but still it is not capable of performing the highly vital duties of muscular tissue, of being as *thoroughly* alive. Degenerated products, therefore, so long as they form part of the body, may still be said to be alive, but less than the normal tissues they replace; and degenerate growth may be justly described as "diminished life,"—or in other words, "partial death." Degeneration in short, is a more or less relapse into a lower and lower form of organic life, and exhibits itself therefore in a variety of grades and amounts. Occurring in various parts, it occasions three-quarters of the chronic illnesses which give work to the physician. Let it be well understood that these half-living tissues are by no means necessarily lessened in size. A battered, tinkered vessel is often much bulkier than a strong new one; and in the same way these under-nourished parts are often enlarged, and so have been wrongly supposed to be over-nourished. They often attain a most cumbersome weight and bigness, without really containing tissue enough to do their work; they become, in truth, a foreign substance. Sometimes they acquire what seems like *a parasitic life, and grow as if independent of the body which they inhabit.*—CHAMBERS.]

Whichever hypothesis is correct, it is a fact universally admitted by the scientific world, that by freely supplying the "means of respiration," an extensive development of fat is pro-

duced in the body, and that, by reducing that supply, not only no new fat is deposited, but that which has been deposited is consumed as material for heat, and vanishes out of the tissues.

I think that I have shown you that the results communicated by Mr. Banting are in perfect harmony with the opinions and experience of physiologists, and I have now only to draw your attention to the explanation of those results, according to the principles of my own special profession, viz., that of practical medicine.

I shall, therefore, attempt to describe the relation which the principles of the Banting system bear to those principles which are followed by the faculty. Although the expression is hardly appropriate, it is unnecessary to correct Mr. Banting when he calls his immoderate corpulence a "tiresome parasite." The correct idea was in his mind, that corpulence could not properly be called an illness, so long as the functions of the body did not materially suffer from it. Medical science likewise hesitates to designate every little increase in the normal production of fat as an illness, although the dangers which arise from an excessive degree of fat have always been sufficiently appreciated by the physicians of antiquity.

Medical men have always treated corpulence more by a system of diet, than by prescribing drugs. Galen, one of the greatest physicians of ancient times, who lived in the second century after Christ, has written a work specially on "the fat and lean mode of life." And we find in the works of Hippocrates (who lived at an earlier period, and was a contemporary of Pericles), and of Celsus (who lived in the time of the Emperor Augustus), precise dietetic prescriptions for those who are corpulent and who desire to become thin. At the present day also, certain specified rules of diet form the most important part in the treatment of corpulence, and we may confidently assert, that our modes of treatment are founded entirely upon rational principles.

Scientific medical men have always endeavoured to discover the laws according to which the remedies applied may lessen or modify the progress of disease, but our knowledge of the intricate processes which it is necessary to follow in most diseases is still too superficial, and our experience of the changes produced by medicine in the economy of the body is too limited, to permit us to say that great results have yet been attained. The treatment of many, indeed I may say of most, diseases is therefore still merely empirical. But the treatment of corpulence is different. The object to be attained is much more definite, and our knowledge of the means and result is much more accurate than in the case of most diseases. The physiological effect of the agents employed is much better ascertained than that of most drugs. For this reason we are justified in saying that the treatment of corpulence, which is now taught, is a strictly rational treatment.

The object which the scientific physician has to consider in the treatment of corpulence is twofold.

1st. He must increase the process of combustion, which the body is constantly undergoing, to such a degree that all superfluous fat shall be consumed.

2ndly. He must reduce the addition of fresh "materials" of combustion until the accumulated surplus fat is absorbed. The means by which the production of heat can be increased are pretty well known to us, and we can develope most of them artificially. Fever, an illness with which many of you are acquainted, is caused by a too highly increased production of warmth. The body is overheated, and its normal temperature, about 30 degrees Réaumur, is raised several degrees, and this it is that causes the patient to complain of glowing heat, burning thirst, and which accounts for the reddened face, heated appearance, galloping pulse, and other visible symptoms of fever. Naturally more material is required to sustain this overheating of the body, than for maintaining it at its normal temperature.

Fever "consumes" in the fullest sense of the word, for it

consumes by means of the combustion of the component parts of the body in addition to the accumulated fatty portions. Every one knows that with persons suffering from fever the fat disappears, and they become thin. In a short time they lose many pounds in weight, and thus the artificial production of fever would prove an infallible method of quickly reducing immoderate corpulence: but such a method would be a wanton attack on the organism of the body, of which no one would be guilty. It would be a direct violation of the only motto, "to cure if possible, 'cito, tuto, et jucunde:'" that is, quickly, safely, and pleasantly.

There are fortunately other means at our disposal by which the same end can be surely though slowly attained (non cito sed tuto).

Every motion of the muscles produces a certain proportion of heat, or to speak scientifically liberates a certain number of particles of warmth, which are thus lost to the body. This loss is, however, immediately made good by an increased development of warmth and an increased energy of combustion.

[We have seen that two substances exist in the body called fibrine and albumen, the former entering into the composition of the muscles, the latter that of the nerves. Now these substances are contained in our vegetable food, and it appears that they are directly conveyed from the vegetable to the animal. We have no knowledge of any power in the animal system to manufacture these substances. All the nitrogen which is contained in an animal is derived from the vegetable kingdom. It is the peculiar property of the plant to be able, in the minute cells of which it is composed, to convert the carbonic acid and ammonia which it gets from the atmosphere into fibrine and albumen. By easy chemical processes we can separate these substances from our vegetable food. Wheat, barley, oats, rye, rice, all contain fibrine, some of them also albumen. Potatoes, cabbages, and asparagus contain albumen. It is a well-ascer-

tained fact that those substances which contain most of these "nutritious secretions" as they have been called, support life the longest. Liebig calls them "flesh-formers." They undergo little change during digestion, and present themselves in a pure state in the blood, where they are directly employed in the renewal of nervous and muscular matter. They are the agents which renew the thinking and working powers of man. They are probably destroyed at the same moment that the carbon is converted into carbonic acid gas, but in their last stage they pass off the body in the form of urea. The nitrogen lost in the destruction of the fibrine and the albumen is found in the nitrogen of the urea. Mere existence is represented by the loss of carbonic acid, but the work of the system in its thought and its muscular labour is represented by the nitrogen of the urea. Nor is this the mere dream of the theorist: it has been practically demonstrated that increased stress upon the nervous system, viz., *brain-work, emotion, or excitement from disease, increases the quantity of urea and the demand for nitrogenous food.* In the same manner the amount of urea thrown off is the representation of the amount of muscular work done.—LANKESTER, *Journal of Social Science*].

By every physical exertion or movement of the muscles we use up, in proportion to the violence of that exertion, a certain amount of the corporeal fuel of combustion, just as a locomotive engine, in order to run a certain distance, consumes so much wood or coal. But long before one of our intelligent countrymen discovered this law, according to which a certain amount of heat is converted into a corresponding amount of mechanical exertion, the facts which now enable us to understand this discovery were well known, and frequently used by physicians in the treatment of corpulence. Every one must have noticed that violent muscular exertion and excessive hard work checks the development of fat; that men and animals become lean from hard work, and that agricultural labourers,

blacksmiths, and all men who undertake rough work are generally thin, although they absorb a plentiful supply of "the means of respiration."

In many villages the inhabitants live chiefly on potatoes and cider, and only eat meat occasionally in the course of the year, and yet in spite of this plentiful supply of "the means of respiration," we seldom meet a "Banting figure" amongst them. It can easily, therefore, be understood why medical men have always earnestly recommended all corpulent people to take much exercise, to sleep little, and to undertake some mechanical labour.

It may interest you to hear that the numerous corpulent persons who yearly visit Karlsbad, Marienbad, Kissingen, and other similar places, even now minutely follow the rules which were established by Hippocrates more than 2000 years ago for the cure of his fellow-creatures who then suffered from similar complaints.

The morning walk of an hour's duration exactly corresponds with the precepts of the followers of Esculapius, who ordered corpulent people to take a long walk before their breakfast.

It is true that poor Mr. Banting derived no benefit from his rowing: indeed, whilst taking that exercise, he became still more corpulent, but you must remember that his appetite then increased to a fabulous extent, and you know with what kind of nourishment he satisfied it. We can, however, confidently assert that Mr. Banting would soon have become thin if he had again tried rowing, *when he later adopted his system of diet.*

I will only mention one more mode of accelerating combustion, or as it is ordinarily called "the waste of the body," viz., by the application of cold, in the form of fresh and salt water baths, shower baths, and cold sponging. It has been ascertained by testing the temperature of the body during a cold bath or shower bath, that during these processes, although giving out a considerable amount of heat, it retains its normal temperature: which fact proves that a violent expenditure of

heat, caused by the combustion of the constituent parts of the body, considerably stimulates the production of warmth. At any rate, cold baths and similar applications were recommended in cases of corpulence, long before the principles were discovered which accounted for their favourable effect, and explained the results attained by them.

I shall not allude to other methods which are used for accelerating combustion and promoting the absorption of food. From all that I have said, you must be convinced that there are powerful means at our disposal, to enable us to accomplish the first task which science has placed before us in the treatment of corpulence. Those methods of cure, of the success of which there is no doubt, are not alluded to in the prescriptions of the "Banting system."

I will now shortly allude to the second principle which, as you know, requires that the supply of new materials of combustion should be withheld, until the accumulated fat in the body has been consumed. It cannot be positively stated that this principle, although its correctness is generally acknowledged, has yet received in practice the attention which it deserves. In order precisely to carry out its principles, it would seem to be necessary to reduce, as much as possible, the supply of all those "means of respiration" which I have already mentioned, such as fat, sugar, starch, vegetable gum, and those substances which during the process of digestion are converted into sugar. It is true that more than 1800 years ago, on purely empiric grounds, Celsus recommended to thin persons "pinguia et dulcia," *i.e.*, fat and sweet aliments, and forbade the same to corpulent persons.

This maxim of the old Roman savant, has by no means been overlooked. Gerhard Van Swieten, who in the last century was summoned by the Empress Maria Theresa from Leyden to Vienna, and who transferred the splendour of that Dutch University to the Imperial metropolis, expressly mentions this dictum of Celsus in his celebrated commentaries on

the Aphorisms of his great teacher, Boerhaave; and Van Swieten endeavoured to explain it upon the then known scientific principles, and to account for the fact, that the use of vegetable aliments has a tendency to produce fat. He maintains that there must be a great amount of secreted fat in vegetable food: for cows, which feed only on hay and water, are able to produce such a fatty substance as milk, and when the secretion of milk ceases, they have a tendency to become immoderately fat from the same nourishment. One would think that this simple and evident fact which Van Swieten quotes, would have suggested to all thinking medical men the prohibition of the immoderate use of bread and potatoes, as well as of fat, to corpulent persons. At any rate, when Liebig's discoveries of the laws of nourishment, and the production of fat became known to every scientific man, one would be inclined to think that rich aliments containing starch and sugar would have been generally forbidden in the treatment of corpulence. But it is not so.

Although reasoning upon sound principles, thin persons were recommended to take a plentiful supply of fat, and also of other "means of respiration," such as soups, chocolate, sweet grapes, extract of malt, and strong malt liquors, yet, until lately, it was thought sufficient in order to obtain the reverse effect, *i.e.*, to make persons thin, merely to forbid the use of fat—and not to recommend an abstention from other means of respiration, such as the so-called fat producers. I will here give a striking example. At Carlsbad, that refuge for all corpulent persons, it is considered a crime to eat butter or fat gravies, but the patient is allowed to drink coffee with milk and sugar, and to partake freely of pastry and sweet puddings.

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